UNIVERSITY OF CAPE COAST

PERFORMANCE AND CHALLENGES OF THE DOMESTIC BROILER CHICKEN VALUE CHAIN AND IMPLICATIONS FOR AGRICULTURAL GRADUATE EMPLOYMENT IN GHANA

BOMBASON KWEKU TUOHO

2023

UNIVERSITY OF CAPE COAST

PERFORMANCE AND CHALLENGES OF THE DOMESTIC BROILER CHICKEN VALUE CHAIN AND IMPLICATIONS FOR AGRICULTURAL GRADUATE EMPLOYMENT IN GHANA

BY

BOMBASON KWEKU TUOHO

Thesis submitted to the Department of Animal Science of the School of Agriculture, College of Agriculture and Natural Sciences, University of Cape Coast, in partial fulfilment of the requirements for the award of Doctor of Philosophy degree in Animal Science (Management of Livestock Enterprises).

MARCH 2023

DECLARATION

Candidate's Declaration

I hereby declare that this thesis is the result of my own original research and that no part of it has been presented for another degree in this University or elsewhere.

Candidate's Signature: ..... Date: .....

Name: Bombason Kweku Tuoho

Supervisors' Declaration

We hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on supervision of thesis laid down by the University of Cape Coast.

Principal Supervisor's Signature: ..... Date: .....

Name: Prof. Julius K. Hagan

Co-Supervisor's Signature: ..... Date: .....

Name: Prof. Martin Bosompem

Co-Supervisor's Signature: ..... Date: .....

Name: Prof. Samuel Kwesi Ndzebah Dadzie

ABSTRACT

The study analysed the performance and challenges of the domestic broiler value chain (VC) and its implication for agricultural graduate employment in Ghana. The mixed method of the concurrent nested strategy model was used. The simple random sampling technique was used to select 345 broiler producers in the Greater Accra, Ashanti, and Bono regions. Census was employed in taking data from 70 feed millers, 40 poultry processors, and 123 live bird sellers and 1,129 final year agriculture students from the University of Cape Coast, Kwame Nkrumah University of Science and Technology, University of Energy and Natural Resources, and Akenten Appiah-Menka University of Skills Training and Entrepreneurial Development. Structured interview schedules and questionnaire were used to collect data. Which were analysed using statistical techniques including frequencies, percentages, means, and standard deviations, as well as ANOVA, SFA translog profit function model, probit and multivariate probit regression models. Kendall's coefficient of concordance was used to rank actors' challenges, which included price volatility of maize and soybeans, high cost of feed and competition from cheap poultry meat imports. Broiler producers had gross margin (GM) of GH¢ 28.4 and profit efficiency of 62.9%, a live bird seller's GM was GH¢ 28.2 and a profit efficiency of 34.4%, whilst a poultry processor had GM of GH¢ 20.9 and a profit efficiency of 79.9%. Significant differences were found in students' perceived knowledge level in these broiler VC activities, inputs production and distribution, marketing of broiler, provision of support services, and broiler production. On perception, there were significant differences in the constructs economic, government policy and social-cultural perceptions. Students' choice to engage in the broiler VC was largely driven by having parents in poultry enterprise, knowledge of specific VC activity. Whilst males are more likely to choose broiler VC business as a carrier. It is recommended that agriculture programmes of study in Ghanaian universities be designed based on the value chain concept with a practical approach to teaching and learning to equip students' become entrepreneurs or employees. The development of a national poultry policy to create an enabling business environment and increase access to market for actors is also recommended.

KEY WORDS

Broiler chicken

Employment

Gross margin

Knowledge

Perception

Profitability

Student

Value chain

Vocation

ACKNOWLEDGEMENTS

The Ph.D. journey is a privilege, so it is to have a supervisory team that is committed to providing the guidance and support needed. Considering this, I want to express my profound appreciation to the team that supervised me; Prof. Julius K. Hagan, Prof. Martin Bosompem, and Prof. Samuel Kwesi Ndzebah Dadzie. I am eternally grateful for all your guidance and wise counsel. I also want to specially thank Prof. Robert Aidoo of KNUST for all the support you gave me during this Ph.D. programme.

Mention must also be made of Mr. Kwabi Sarpong of Holand Akorkor. Staff of the district offices of the veterinary services directorate and departments of agriculture in the study regions, for the information you provided that aided the data collection for this research, I say thank you. Indeed, my student data collection at KNUST, AAMUSTED and UENR was excellent and smooth; it was certainly due to the involvement of key lecturers, departmental and faculty examination officers. I say a special thank you to all that made it possible for me.

I also want to express my appreciation to the staff of BoG, VSD HQ, APD HQ and FDA HQ for providing the relevant documents to support this research. To my former colleague at work, Mr. Evans Saah, who dedicated his time and resources for this research work, I am grateful. Your support was exceptional. Also, Mr. Benjamin Oduro Owusu was with me all through the research process. I am very grateful for your support and all the sacrifices you made.

Since this research was self-funded, I want to appreciate my wife, Alice Winnimi Tuoho and my mother, Elizabeth Atakora for their support in this process.

DEDICATION

This work is dedicated to my beloved wife, Alice Winnimi Tuoho and our children. To my mother, Elizabeth Atakora and the memory of my late father, Dennis Tuoho Waala. In them I found the love, courage, and possibility spirit to undertake this PhD programme.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRNOYMS

A Level	Advance Level
AAMUSTED	Akenten Appiah-Menka University of Skills Training and Entrepreneurial Development
AfCFTA	African Continental Free Trade Area
ANOVA	One-Way Analysis of Variance
APD	Animal Production Directorate
BCR	Benefit–Cost Ratio
DEA	Data Envelopment Analysis
DHS	Demographic and health survey
DoCs	Day-Old Chicks
ECOWAS	Economic Community of West African States
EIA	Environmental Impact Assessment
EU	European Union (EU)
FAO	Food and Agricultural Organisation
FDA	Food and Drugs Authority
FIAS	Foreign Investment Advisory Service
FSHS	Free Senior High Schools
GCA	Ghana Census of Agriculture
GDP	Gross Domestic Product
GHABROP	Ghana Broiler Revitalization Project
GHG	Green House Gas
GLSS	Ghana Living Standards Survey
GM	Gross Margin
GNAPF	Ghana National Association of Poultry Farmers
GoG	Government of Ghana

GSS	Ghana Statistical Service
HND	Higher National Diploma
HPAI	Highly Pathogenic Avian Influenza
HQ	Headquarters
HRI	Hotels, Restaurants and Institutions
IB	Infectious Bronchitis
IBV	Infectious Bronchitis Virus
IRR	Net Internal Rate Return
KFC	Kentucky Fried Chicken
KNUST	Kwame Nkrumah University of Science and Technology
METASIP	Medium Term Agriculture Sector Investment Plan
MLE	Maximum Likelihood Estimates
MLGRD	Ministry of Local Government and Rural Development
MOFA	Ministry of Food and Agriculture
MPPU	Mobile Poultry Processing Unit
MT	Metric Tonnes
MVP	Multi Variate Probit
NABC	Netherlands-African Business Council
NFI	Net Farm Income
NPV	Net Present Value
O' Level	Ordinary Level
OECD	Organisation for Economic Co-operation and Development
PAM	Policy Analysis Matrix
PFJ	Planting for Food and Jobs
RFJ	Rearing for Food and Jobs

SFA	Stochastic Frontier Approach
SHS	Senior High Schools
SRID	Statistics and Research and Information Directorate
SSA	Sub-Saharan Africa
SWOT	Strengths, weaknesses, opportunities, and threats
UCC	University of Cape Coast
UENR	University of Energy and Natural Resources
USA	United States of America
USDA	United States Department of Agriculture
VC	Value Chain
VSD	Veterinary Services Directorate
WASSCE	West African Senior School Certificate Examination
WTP	Willingness to Pay
YiAP	Youth-in-Agriculture Programme

CHAPTER ONE

INTRODUCTION

Background to the Study

Agriculture remains an important growth engine for Ghana's economy aside from the provision of food and nutrition security. The agriculture sector in Ghana has a larger employment capacity (Aryeetey & Baah-Boateng, 2016; Baah-Boateng, 2013). The sector provides 34 percent of the workforce (Ofori-Atta, 2018b), and contributes 19.7 percent to the gross domestic product (GDP) with the livestock subsector contributing 2.7 percent (Ghana Statistical Service, 2019c). The agricultural sectors GDP is calculated to include the following subsectors: crops, livestock, forestry, and logging as well as the fishing sector. Livestock is one of the fast-growing sub-sectors in agriculture (Robinson & Pozzi, 2011), and it has an incremental impact on some other sectors including the manufacturing and service sectors. Fairly distributing wealth, in some African countries the livestock sub-sector serves as a means for the poor to exit poverty (African Union, 2015; Mensah-Bonsu et al., 2019; Rich et al., 2009).

Africa's livestock sector is endowed with the potential to transform the social and economic fortunes of the continent. It adds between 20 to 50 percent of value-addition to the agricultural sector (Nouala et al., 2011). In some countries across Africa, livestock contributes between 30 to 80 percent of the agricultural GDP (Robinson & Pozzi, 2011). Specifically, in South Africa, poultry constituted the largest segment of the agricultural sector's GDP at 16 percent (Nkukwana, 2018). Conversely in Ghana, the livestock sub-sector's contribution to GDP continues to decline over the years, ranging from

4.0 percent [2014] to 2.7 percent [2018] respectively for the entire livestock sector (Ghana Statistical Service 2019c).

The poultry industry worldwide is the fastest growing sub-sector within agriculture. It efficiently utilises natural resources for the production of protein to meet the global nutritional requirement while contributing the least greenhouse gas (GHG) emissions within the livestock sub-sector (Mahama et al., 2013; Mottet & Tempio, 2017). In Ghana, poultry is the largest sub-sector of livestock (Mensah-Bonsu et al., 2019). Poultry production in Ghana is often segmented into traditional and non-traditional. The traditional poultry species include ducks, turkey, guinea fowls, chickens, and doves. These are mostly produced to supplement income whereas the non-traditional include quails, pigeons, ostriches, broilers, and layers (Atuahene et al., 2010; Mensah-Bonsu & Rich, 2010). In terms of the purpose of production, it is either commercial or for home consumption. For commercial production purposes, poultry farmers raise either layers for egg production or broilers for meat production. However, in recent times, farmers are also producing cockerels for meat. These constitute the commercial poultry sector in Ghana. Broilers and layers were introduced into Ghana in 1960 as part of the Government's effort to increase animal protein supply to the population and diversify incomes of farm households (Andam et al., 2017; Teye & Seidu, 2018).

For this study, the focus is on broilers, specifically the domestic broiler value chain. Broilers are solely raised for meat and the key broiler producing regions in Ghana are the Greater Accra, Ashanti, Bono, Central and Eastern regions (Amanor-Boadu et al., 2016).

Domestic broiler value chain businesses are confronted with challenges including the over dependence on importation of feed ingredients due to shortfall in local production and supply (Amanor-Boadu et al., 2016; Andam et al., 2017; Bekoe, 2021). High cost of energy in terms of fuel and electricity and national macro-economic volatility (Babu & Shishodia, 2017:3; Bank of Ghana, 2022), and high cost of feed for broiler producers (Etuah, 2014), and competition from cheap poultry meat imports (Onumah et al., 2021; Tuffour & Sedegah, 2013), amongst others. These affects the profitability of businesses along the chain and hamper their growth.

For these reasons, the Ministry of Food and Agriculture (MoFA) initiated the Planting for Food and Jobs (PFJ) policy (2017-2020) to increase the agricultural sector's contribution to GDP through increasing productivity at the farm level. The initiative made available extension services, subsidised fertilizer, and certified crop seeds to farmers (Ministry of Food and Agriculture, 2017). The increased availability of cereals (maize and soybean) is expected to benefit layer and broiler producers. Another policy initiative of MoFA was the Rearing for Food and Jobs [RFJ] (Akoto, 2019). The objective was to develop a competitive and efficient Ghanaian livestock industry to increase production, create employment, and improve livelihoods.

In recent times, the value chain (VC) concept has been used across the globe to address constraints that limit agricultural sector businesses or enterprises from growing and generating the much needed revenue to enable employment in the sector and poverty reduction (Belt et al., 2017; Middelberg, 2017; Nassirou Ba, 2017). Some authors have postulated that in applying the concept of value chain, small businesses can be linked to markets of high

value to enable them to compete favourably (Reji, 2013). Value chains are made up of activities that are shared between different businesses. The various chains in a value chain are linked together and at each link, there is an addition of value and margin (Food and Agricultural Organisation, 2015a; Hakemulder, 2015; Mitchell et al., 2009). The value chain approach focuses on establishing the challenges and opportunities to the success of a given business by looking at the actors along a given value chain, their internal and external integration, avenues for marketing, finance, infrastructure, and the prevailing policies that support or otherwise the growth of the business (Rej, 2013).

The broiler value chain is very productive because broilers have a short life cycle of production which enables a producer to undertake at least five production cycles in a year (Mottet & Tempio, 2017; Nti, 2018). It has also been established by Mensah-Bonsu et al. (2019) that compared to layer production, broiler production was more profitable. Further to this, broilers are mainly produced for meat. At the same time Ghana's current poultry meat import bills keep increasing each year by at least 15.2 percent of the previous year's figures. For instance, in 2018 the import figures stood at 174 million dollars (Andam et al., 2017; Ofori-Atta, 2018b; Nti, 2018). Similarly, available data from Bank of Ghana shows that chicken meat constitute more than 90 percent of the total poultry meat (chicken, duck, turkey, guinea fowl and geese) imports into Ghana (Bank of Ghana, 2021). The broiler value chain is also reported to create more jobs than the layer value chain (South African Poultry Association, 2018; Van Horne, 2018). It can, therefore, be surmised that the broiler value chain though riddled with challenges, has the potential to generate the most employment opportunities, particularly for agricultural

graduates and the youth in general, and would make the most impact in terms of socioeconomics, and nutrition for Ghana's economy, if it is developed (Mottet & Tempio, 2017).

Despite this demonstrable potential of the domestic broiler industry to provide quality employment particularly to young people, Sumberg and Okali (2013) have argued that there is long-standing evidence suggesting that there is no linkage between agriculture as an employment opportunity for young people in Africa. Since parents and young people hold agriculture in low esteem, rural parents educate their children to enable them to get jobs in the formal public or private sectors to avoid farming.

Statement of Problem

According to Kaplinsky and Morris (2001), "value chain describes the full range of activities which are required to bring a product or service from conception, through the different phases of production, delivery to final consumers, and final disposal after use" (p. 5). The value chain approach has been found to increase profit for actors along the chain and creates employment (Khaleda, 2013).

Value chain approach comprehensively considers the supply of inputs, primary production, processing, and marketing in a well-linked and sequential manner. As such growth in the production of chicken meat in Ghana would lead to expansion in the demand for maize and soybean as the main ingredient for chicken feed, this would impact favourably on smallholder and large-scale crop farmers while at the same time increases economic activities around processing, packaging, and transportation (Amanor-Boadu et al., 2016; Andam et al., 2017).

There is a growing demand for chicken meat and other processed meat in Ghana fuelled by lifestyle changes, urbanisation, and increasing incomes in line with Bennett's law (Andam et al., 2017; Robinson & Pozzi, 2011; Samboko et al., 2018). This surge in demand for meat presents a huge opportunity for the local broiler industry with attendant positive implications for job creation at every node of the value chain.

Different actors are engaged in the broiler value chain for different economic reasons. For small scale broiler producers, they keep their birds as a safety net and an avenue to acquire assets to escape poverty. At the national level, it serves as a major source of livelihood and a source of lean meat (McLeod et al., 2009). A growth in Ghana's poultry industry would increase the demand for feed ingredients (Andam et al., 2017) whilst addressing the issue of ever-increasing import bill of Ghana, partly attributable to large importation of frozen chicken and meat products (Andam et al., 2017; Etuah et al., 2021).

Despite the foregoing positive contributions, the broiler value chain in Ghana is underdeveloped and characterised by poor performance at the various nodes along the chain. Additionally, there is lack of coordination and trust among actors of the broiler value chain. Consequently, the sector has constricted with broiler production now centred on festive occasions (Andam et al., 2017). For these reasons, broiler producers supplied less than 25 percent of the demand for chicken meat in Ghana in 2017 (Ashitey, 2017).

Sumberg et al. (2017) between the early 1960s to 2013 identified the constraints and problems confronting the commercial poultry industry per government policy documents as strategies, agendas, and statements to include

high mortality associated with disease, the need for improved or appropriate technology, the high cost of feed, inadequate markets, lack of processing capacity and inadequate disease surveillance, amongst others.

There are also issues of economic efficiency in production on the part of actors. Considerable evidence suggests that one of the reasons for the high production cost by most actors of the local broiler value chain is due to profit inefficiency, as the actors fail in their productive resource allocation (Dziwornu & Sarpong, 2014;Yevu & Onumah, 2021). The below average performance of the sector does not help Ghana to benefit from the opportunities that a growing broiler industry brings to a country, especially employment generation.

This is more so, as the opportunities for public sector employment keep shrinking each year. Between 2000 and 2010, there has been a decrease from 7.2 percent to 6.4 percent (Baah-Boateng, 2013). With the estimated 250,000 young people that enter the labour market yearly, the formal sector employs only 2 percent (Otoo et al., 2009). Empirical data have shown that in Ghana high unemployment rate is reported among educated people who completed secondary school and above compared to the uneducated or those without secondary education (Aryeetey & Baah-Boateng, 2015).

Similarly, the Ghana Living Standards Survey (GLSS) round seven report shows that, graduates of senior high schools (SHS) who hold either WASSCE, O' level, or A Level certificate, recorded the highest rate of unemployment (21.5%). The second highest was persons with Diploma and Higher National Diploma (HND) qualifications (15.9%) whereas those

without educational qualifications recorded the lowest (6.5%) unemployment rate (Ghana Statistical Service, 2019b).

Despite this, the Government of Ghana (GoG) introduced the free senior high school (FSHS) policy in 2017 (Ofori-Atta, 2017). This would produce additional job seekers who fall in the category of people vulnerable to unemployment per the findings of Aryeetey and Baah-Boateng (2015), and Baah-Boateng (2013). This brings to fore the need to explore potential areas of the economy that can employ these youths.

There has been a considerable amount of evidence from literature, that suggests consistently that in many developing countries including Ghana, the youth do not have interest in agriculture as a means of self-employment (Leavy & Hossain, 2014; Mwaura et al., 2015; Okali & Sumberg, 2012; Sumberg, Yeboah, et al., 2017; Sumberg & Okali, 2013; White, 2012). Some educated Ghanaian youth see agriculture as a vocation for poor rural people and illiterates (Mwaura et al., 2015). It is therefore, not surprising that among the 3,037,381 persons engaged in agriculture in Ghana, only 29.7 percent of them were youth (Ghana Statistical Service, 2019a).

The lack of interest of the youth in poultry and agriculture in general could partly be influenced by resource and capital constraints (Kidido et al., 2017; Góngora et al., 2019). The mechanisation of agricultural activities, provision of reliable electricity supply, availability, and access to agricultural inputs such as fertilizer remains critical to ameliorate the situation (Daum et al., 2019).

Additionally, growth inhibiters of Ghana's poultry industry and agribusinesses in general have been identified and outlined (Atuahene et al.,

2010; Bosompem et al., 2017; Teye & Seidu, 2018) to include lack of market for products, high importation of agricultural products, absence of financial and insurance products that address the needs of agribusinesses and short comings in Ghana's land tenure system and disease out-breaks. Issues related to limited access to finance, land tenure challenges, and policy incoherence have lingered on, leading to suboptimal performance of the broiler value chain in Ghana (Daum et al., 2019). This has become a barrier to entry into agribusiness ventures by young people. All these problems outlined has nutritional, economic and social implications which can adversely affect national development if not properly addressed.

The study builds on the national poultry census conducted by Amanor-Boadu et al. (2016) which focused on the structure of Ghana's poultry industry but did not look at youth employability in the sector. Similarly, Okali and Sumberg (2012) studied youth employability in the agricultural sector through tomato production in the Brong-Ahafo Region. Though, there may be some lessons to be learned from this study, youth employment opportunities in the broiler industry are still a new frontier that requires research.

Further to this, perceived knowledge level in agricultural value chains have been reported to influence youth involvement in agriculture as a vocation or businesses (Magagula & Tsvakirai, 2020; Mulema et al., 2021). The perception of youth on agribusiness or agriculture is also reported to influence their participation (Salvago et al., 2019). Additionally, individual socio-demographic characteristic such as sex, the occupation of parents', place of residence amongst others has also been reported to influence the engagement of the youth in agricultural value chains (Mabe et al., 2020). However, there is

no known studies on how perceived knowledge level and perception of students (youth) influence their engagement in the domestic broiler value chain.

Research Objectives

General Objective

The general objective of this study was to assess the current performance and challenges of the domestic broiler chicken value chain and the implication for agricultural graduate's employment in Ghana.

Specific Objectives

The study was aimed at achieving the following specific objectives:

1. To map out major activities of the local broiler value chain to show the relationship among key chain actors and product pathways from the farm gate to the final consumer.
2. To evaluate the challenges at major nodes of the local broiler value chain.
3. To conduct profitability analysis of major broiler value chain activities.
4. To examine the perception of Ghanaian tertiary students towards choosing broiler value chain business as a vocation.
5. To examine drivers of Ghanaian tertiary students' engagement in the domestic broiler value chain.

Research Questions

The following research questions guided the study:

1. How are the key actors in the local broiler value chain related and what are the channels of distribution from the farm gate to the final consumer?

2. What are the challenges inherent in the major nodes of Ghana's broiler value chain?
3. How profitable are the major activities along the domestic broiler value chain?
4. What are the perceptions of Ghanaian tertiary students towards choosing broiler value chain business as a vocation?
5. What are the drivers of Ghanaian tertiary students' engagement in the domestic broiler value chain?

Variables of the Study

The variables of the study were:

For objective 3:

Dependent variable – Profit margin measured by gross margin per broiler bird (live or whole-dressed) produced or processed locally.

Independent variables – Cost of inputs (feed, vaccines, medicine/drugs, day-old chick, cost of bird at market age, other cost), individual personal characteristics - formal level of education, membership of association, access to credit, extension contact, type of labour used (family or hired), household size.

For objective 5:

Dependent variable – Willingness to participate in local broiler (poultry production) value chain activity (1=yes; 0=otherwise).

Independent variables – Individual personal characteristics (educational level, age, and sex), family background (main occupation of parents, previous or current experience with poultry business, etc.),

location of household (rural or urban), perceived knowledge level and perception variables on broiler value chain activities.

Significance of the Study

The study aligns with the recommendations of the Ghana Census of Agriculture (GCA), 2017/18 which recommended amongst other things that government "promote agriculture as a viable business among the youth" and "improve agricultural value chain systems" (Ghana Statistical Service, 2019a, p. 259). It is also consistent with earlier government policy directives as far back 1999 when poultry production was selected as one of the sectors under the Youth in Agriculture Programme (YiAP), designed to reduce youth unemployment and enhance their economic status (Ministry of Finance, 1999).

This has become more pertinent because out of the 2,158,697 farm owners in Ghana. Only 519,788 were found to be youth (Ghana Statistical Service, 2019a, pp. 28-31). This study, therefore, would help in understanding the reasons keeping the youth away from taking up agribusiness as an entrepreneurship or as a vocation, particularly in the broiler value chain, and how they can be addressed.

According to the Ghana Census of Agriculture report, only 3.0 percent of farmers from agricultural households in Ghana are involved in livestock rearing (Ghana Statistical Service, 2019a). This is one of the plausible causes of low performance or output of the broiler value chain. This makes it imperative to ascertain the reasons for the poor performance for the purposes of drawing up an industry-wide development plan to revamp the domestic broiler value chain system with input from the findings of this study.

In the area of contribution to knowledge, this study would add to the literature in broiler value chain studies that have evaluated the performance of the domestic broiler value chain. More importantly, the focus on the employment potential of the broiler value chain. The evaluation of the profit levels of three nodes of the domestic broiler value chain, alongside measuring undergraduate student's perception toward engaging in activities of the chain, and what would drive their engagement in the chain, makes this study novel among other studies conducted on the domestic broiler value chain. This helps in determining whether the undergraduate students would want to choose broiler value chain economic activities after graduation as a business or vocation. The results could be used to guide young entrepreneurs and employment seekers in making the decision on which aspect of the broiler value chain business to invest in or choose as a vocation.

Recommendations from the study would help shape government policies on youth employment particularly, in the livestock subsector of agriculture, as well as the programmes of development partners such as non-governmental organisations (NGOs). It would also benefit actors in the poultry value chain in general. As it has highlighted the inherent challenges and opportunities of the broiler value chain that poultry producers, investors, and input suppliers can take advantage of to grow their businesses. The focus on students studying agriculture and agriculture related programmes has also brought to light the need to design these programmes with the value chain concept in mind such that students have knowledge and skills beyond the production aspect of agricultural commodities. As the findings of this study have shown that students who have knowledge and skills in specific broiler

value chain activities are more likely to engage in them as a business or vocation after graduation.

In theory, the study would add to knowledge in value chain analysis in the broiler industry and its impact on employment.

Delimitations of the Study

The study was focused on selected activities of the domestic broiler value chain (inputs supply, production, processing, and marketing), it mapped major chain activities, assessed the challenges, performance, and profitability of key activities (feed milling, broiler production, poultry processing, and live bird marketing) along the broiler value chain in four major poultry producing regions of Ghana. The broiler producers that were targeted for the study should have produced broiler at least one cycle, between January 2021 and May 2022. It also assessed the employment potential of the broiler value chain, and what would attract or repel young people (undergraduate final year university students) from choosing broiler value chain businesses as entrepreneurs or employees. The study was undertaken in four regions of Ghana, the Greater Accra, Central, Ashanti, and Bono Region. The populations for the study were drawn from feed millers, broiler producers, and poultry processors. The rest were live bird sellers and final year undergraduate's students studying agriculture and agriculture related programmes in four public universities.

The student aspect of this study was also focused on final year students studying agriculture programmes. Students perceived knowledge level on the six major domestic broiler value chain activities were measured, while their perception toward choosing these activities to engage in after graduation was

also measured. The factors that would drive a student in choosing to engage in the broiler value chain was also predicted using a regression model.

Limitations of the Study

The difficulty in sourcing documents and other relevant information from key GoG agencies was one of the challenges of this research. The refusal of some actors of the domestic broiler value chain to participate in the study affected the sample size and the smooth flow of the data collection. This was probably due to survey fatigue or the reluctance of some commercial poultry farmers to discuss their businesses with strangers. This hampered the field data collection. Some broiler-producing businesses could not be traced due to their collapse or relocation. Some of the broiler producers that were interviewed kept poor production and cost records, hence, this affected the quality of the information, particularly, the cost of production information they provided. This inaccurate cost of production figures may have affected profitability estimates.

Some of the final year undergraduate university students declined to participate in the study, while some participants did not answer all the questions, this affected the anticipated sample size and created the problem of missing data.

Definitions of Terms

Agricultural economics students: Refers to students that are majoring in agricultural economics and agricultural economics education.

Agricultural extension students: Refers to students that are majoring in agricultural extension, community development studies and agricultural extension education.

Agricultural value chain: refers to the supply of inputs, primary production, processing, marketing, provision of support services, consumption and reused of by-products in a well-linked and sequential manner undertaking in the production process and consumption of an agricultural commodity.

Animal science students: Refers to students that are majoring in animal science and animal science education.

Biosecurity: Measures taken to prevent disease entry or spread in a farm including cleaning, disinfection and wearing of protective clothes.

Broiler producer: A farmer that produces broilers.

Broiler value chain: In this study broiler value chain refers to activities undertaking by actors including input production and distribution, broiler production, marketing of broiler (live or dressed), processing of broiler (whole dressed or cuts/parts), management of waste (e.g chicken dropping), provision of support services and consumption.

Broiler: An exotic breed of chicken bred and raised specifically for meat production (Unveren, 2019).

Challenges: In this study challenges refers to limiting factors to the growth of broiler value chain business as well as factors that impede the ability of these businesses to increase their share of gross profit and become profit efficient.

Commercial poultry production: The production of broilers and layers for meat and eggs for the purposes of selling.

Crop science students: Refers to students that are majoring in crop science, horticulture and crop science, crops and soil science education.

Job scarcity rate: percentage of workers without formal employment (Mahadea, 2012)

Livestock: Animals reared for food, commercial or other agricultural purposes including cattle, sheep, goats, pigs and poultry. It excludes domestic animals, such as cats and dogs, unless raised for such purposes (Ghana Statistical Service, 2019).

Perceived knowledge: In this study perceived knowledge is referred to the measure or level of understanding and skill a student have to be able to carry out a specific broiler value chain activity successfully.

Perception: The attitude or judgement students has towards broiler value chain activities and businesses in Ghana

Performance: This refers to the gross margin and profit share of broiler value chain actors computed per bird as well as the estimates of their profit efficiency.

Youth: Youth is defined by the National Youth Policy of Ghana as people between the ages of 15 and 35 years (Ghana Statistical Service, 2016; Ministry of Youth and Sports, 2010).

Study Organisation

The study is presented in five chapters as follows; The chapter one consists of background to the study, statement of problem, research objectives, research questions, variables for the study, significance of the study, delimitations of the study, limitations of the study, the definitions of terms of the study as well as the study organisation.

The chapter two of the study reviewed literature from scientific journals, books, reports from government agencies, and international bodies as well as conference papers and web-based publications. Some of the literature were theoretical and empirical studies that served as foundation for the study.

Following the review, a theoretical and conceptual framework for the study was developed.

Chapter three described the techniques and methods used to conduct the research. The areas covered comprised the research design, study area, study population, sampling procedure and sample size. The rest are data collection instruments, pilot study, data collection procedure, and data processing and analysis.

Chapter four presented the results based on the five-study objectives which include mapping the broiler value chain in the study regions and conducting a SWOT analysis. The evaluation of the challenges of the domestic broiler value chain, analysis of the gross margin, profit share and profit efficiency of the activities of key actors along the broiler value chain as well as assessing and measuring the perceived knowledge level of students and their perception towards engaging in the domestic broiler value chain after graduation. Additionally, the chapter presented the results of the determinants and drivers of students (youth) engagement in the local broiler value chain.

The chapter five provides summary of the findings and conclusions of the research, and recommendations to improve the domestic broiler value chain's profitability and draw the youth into the activities of the chain.

CHAPTER TWO

LITERATURE REVIEW

Introduction

The purpose of the study was to analyse the current performance and challenges of the domestic broiler value chain and its implication for agricultural graduate employment in Ghana. This chapter reviewed literature sourced from scientific journals, books, reports from government agencies, and international bodies as well as conference papers and web-based publications. These literatures were theoretical and empirical studies that provided the foundation for the study. The review of this literature provided an understanding of what has been researched on the domestic broiler value chain, its profitability, and what shapes young people's perception towards engaging in activities of the domestic broiler value chain.

A conceptual framework based on the theories and literature reviewed was developed to direct the studies.

Domestic Production of Commercial Poultry

Poultry production has been considered by successive governments since the 1960s till date, to be critical in filling the acute shortfall of animal protein supply and the creation of employment for Ghanaians (Kwadzo et al., 2013). In line with this, Amanor-Boadu et al. (2016) conducted a study "to describe the structure and performance of Ghana's chicken industry" aimed at shedding light on how Ghana's chicken industry can help improve nutrition, reduce poverty and increase the incomes of actors in the industry (p. 2).

This study was a census on commercial poultry farms. The term commercial poultry farms as per the study definition was based on the intent

of the production which is always to sell and make a profit coupled with a bird population of 50 per year in the case of broilers and 15 per year for layers, which produce 60 eggs per week. Non-commercial farms, also called "backyard" or "village" poultry farms, in this context, was managed differently. Feeding and husbandry is minimally done, with birds allowed "to roam and fend for themselves" (Amanor-Boadu et al., 2016, p. 3).

Although, the following species constitute the poultry sector in Ghana (chicken, turkeys, guinea fowls, ducks, ostriches, geese, and quails) the commercial chicken industry is made up of broiler, cockerel, and layer production, and the main products are meat and eggs. Amanor-Boadu et al. (2016) identified a total of 4,040 poultry farms in Ghana, of these farms 3,889 farms constituting 96.3 percent were either producing layers, broilers, or cockerels. The rest were guinea fowls, 5.2 percent, turkeys, 4.5 percent and ducks, 1.8 percent (Amanor-Boadu et al., 2016; Nti, 2018). This is an increase from the estimated 1,372 poultry farms that was earlier reported by Aning et al (2008).

It was also found that, most of the farms produced more than one type of poultry. A total of 38.8 percent (1,508) of farms produced broiler, whiles 74.3 percent (2,889) produced layers. Among these, 52.4 percent of the broiler farms also produced layers whereas 27.4 percent of the layer farms also produced broilers. Although all the 2,889-layer farms fit into the study definition of commercial poultry, only 98.7 percent (1,488) of the broiler farms qualify as commercial poultry farms. A situation that has been described as "leveraging of resources, revenue diversification and risk minimisation" (Amanor-Boadu et al., 2016, p. 5).

Similarly, an earlier work by Adei and Asante (2012) that examined "the challenges and prospects of the poultry industry in Dormaa District" of Ghana, involved 45 poultry producers who were randomly sampled, out of which 40 were found to produce layers, 1 produced broiler, and 2 were producing both broilers and layers. While 1 produced both layers and cockerels, 1 also produced layers and parent stock.

The Ghana Living Standards Survey (GLSS) round seven (7) conducted by Ghana Statistical Service (2019b), which aimed to provide information on the living conditions of Ghanaians, reported a total chicken population of 16,866,545 nationwide, these were raised by 1,115,757 farmers. The report failed to give a breakdown of the numbers into the various types of chicken raised in Ghana [layers, broilers, cockerels, and backyard or village poultry] (Ghana Statistical Service, 2019b).

Additionally, the "2017/18 Ghana Census of Agriculture (GCA)", was the fourth to be conducted in Ghana since 1950. Generated data for national planning and monitoring of government development programmes and projects, found that, of the 17,709,547 livestock population reported, poultry was the most reared livestock with a total population of 13,086,826 representing 73.9 percent of the total livestock population in Ghana. The breakdown of the poultry figures was exotic chicken (layer and broiler) 6,633,021 (50.7%). This demonstrates that, layers and broiler are the most reared among all the poultry categories in Ghana (Ghana Statistical Service, 2019a).

Poultry Production Systems/Methods

The Food and Agriculture Organisation (FAO) have identified three poultry production systems practiced world-wide including Ghana. This includes industrial and integrated, commercial poultry production, village or local backyard. However, Vermooij et al. (2018) observed that, in East Africa the main poultry production systems are traditional/backyard, intermediary system and non-traditional/commercial system.

Generally, in Ghana, the main production systems are commercial production, which is segmented into two, layers and broilers while subsistence involves backyard production of indigenous/local chicken or guinea fowls (Nti, 2018; Sumberg, Awo, et al., 2017).

Nonetheless, McLeod et al. (2009) identified three broad classification of poultry flock; industrialised flock, they are mostly kept intensively and for commercial purposes. Safety net flock, these are small holder type and mostly indigenous breeds that contribute to livelihood. And the asset builder flock category which are largely hybrid birds kept to help owners overcome poverty. The authors noted that all these flock categories are operated in Ghana.

Similarly, Amanor-Boadu et al. (2016) identified the broiler production systems in Ghana to include "Intensive, Semi-intensive and Free range" (p. 15). The intensive system involved the total housing of birds and provision of feed, water, medication and protection from bad weather and predators. Whiles birds raised under the free-range system are allowed to move freely around and return at night to a provided shed. They are generally not confined compared to those under the intensive system. The semi-intensive system is a blend of both the intensive and extensive system of production. It involves

confining and feeding of birds at some hours of the day and allowing them to fend for themselves in addition. Among these three production systems the most used for commercial poultry production is the intensive system.

Poultry farms are classified on a number of grounds including bird population, farm management practices, infrastructure and biosecurity amongst others. One such classification is by the FAO which categories farms into four major sectors. Sector one (1) farms are industrial and integrated, the biosecurity level on such farms is very high and birds produced are marketed commercially. Sector two (2) focuses on commercial poultry production with a biosecurity level maintain at moderate to high. Although sector three (3) is also a commercial poultry production system, the birds produced are sold at live birds' markets and the biosecurity measures on farms are low to minimal. Sector four (4) is characterised by the production of village or backyard poultry for local consumption with a minimal biosecurity level (Andam et al., 2017; Nti, 2018; Rich, 2011; Vermooij et al., 2018).

Contrary to this, Amanor-Boadu et al. (2016) have classified poultry farms as commercial if a farm produces 50 birds per annum as minimum. This definition is too loose for a capital-intensive industry to use in determining the commercial nature of poultry businesses. Similarly, the FAO classification outlined by Nti (2018) also failed to consider bird population, labour and amongst others. Creating the need for classification that is all encompassing and reflect current production trends in the Ghanaian poultry industry.

Whereas Aning et al. (2008) outlines the structure of Ghana's poultry industry as commercial and poultry keepers. The commercial producers are then divided into large scale if they have capacity to hold birds up to 10,000

and above, medium scale for 1,000 to 5,000 bird's capacity and small scale for 50 to 1,000 bird's capacity. The poultry keepers on the other hand, are those with 150 to 500 bird's capacity referred to as semi-commercial whilst those with 3 to 200 local birds' capacity are also known as backyard/village poultry.

Andam et al. (2017) has opined that in Ghana only one or two farms may fit into the sector 1 of the FAO classification. Whiles majority of farms would qualify to be classified as sector 2 or sector 3, these normally have a bird population between 50 to 5,000 and may constitute 60 percent to 80 percent of poultry farms across the country.

In the commercial poultry production sector in Ghana, farmers housed their birds in either the deep litter system or the battery cage (Aning et al., 2008; Etuah et al., 2020). Whereas the deep litter is used for both broiler and layer production, it appears across Ghana that the battery cage is only used for layer production. Under the deep litter system, bedding materials such as wood shavings are spread on the floor for birds to stand on, it mixes and absorb the faecal dropping, water and feed particles (Gbedemah et al., 2018). The deep litter poultry housing was found to be used by 96.1 percent of broiler farms across Ghana (Amanor-Boadu et al., 2016).

There are also different models of broiler production, this informs the arrangements between a producer and other actors of the broiler value chain. For instance, broiler production is integrated, and contract based in most cases in Brazil, which is always led by an integrator. Although there are some independent producers. The integrator provides the contract grower with day old chicks, feed, vaccine, and veterinary/technical assistance. The grower then takes care of the birds till they reach market weight, this includes providing

housing for the birds, labour, and utilities (Valdes et al., 2015). These growers are then paid for their services by the integrators. Very few broiler producers in Ghana undertake contract growing of birds.

In the EU, as observed by Van Horne (2018), there is the intensive system that involved the use of fast growing genetically superior breeds that reach 2.0kg to 2.5kg slaughter age at 36 days to 42 days. Aside this, there is "alternative broiler production" systems including the extensive indoor system and the free-range system in which birds mature in 56 days respectively. Other systems of production are the traditional free range and free range (total freedom), under these systems the birds take 81 days each to mature. Additionally, there is also the organic production system whereby birds mature between 70 days to 81 days. Some broilers which are slow growing are also kept indoors until they reach 56 days, called "certified" broilers, a type of production system that is growing across Europe.

Little is known about the different broiler production systems or models in Ghana, partly due to the level of the development of the sector and quality of researched data available in the industry (Sumberg et al. 2017).

The Value Chain Concept

According to Porter (1985), value chain is "a representation of a firm's value-adding activities, based on its pricing strategy and cost structure" (Rich et al., 2009, p. 3). On the other hand, the value chain is a term use to describe how physical inputs flows with services to produce new products (Kaplinsky & Morris, 2001).

Historically, different authors have written about value chains albeit under different names or terminologies. Authors such as Womack and Jones

described value chain as value stream, whereas "filiere" (a thread), originated from French scientist (Raikes et al., 2000). The "filiere" represented the 1960s French government agricultural programmes and policies in colonial territories. In which the focus was on production and consumption excluding processing and international trade of agricultural products. Comparatively, the "filiere" approach shows no growth in relationships at the inter-firm level or beyond the firm, nor changes among actors over time, and appears to be "static in character" (Haggblade et al. 2012, p. 4 as cited in den Broeder, 2018, p. 24).

In the book "Competitive Advantage", Porter (1985) introduced the word value chain which was used in the context of the commodity chain, a term used by Hopkins and Wallerstein in an article "Patterns of development of the modern world system" written in 1977(Rich et al., 2009). Porter's value chain, at the time was focused more on "linkages within a firm" compared to how it is used now "to describe backward and forward linkages outside of the firm". Whiles Hopkins and Wallerstein (1977) focused on a product, from input to the time it is consumed. By considering inputs, labour and all the logistics that has been used in the process (den Broeder, 2018, pp. 23-24).

Porter's view of the value chain concept was centred on competitive advantage, drawn from the activities that a firm does, such as designing, producing, marketing, distributing a product, and supporting services. All these add cost to a firm and can also be differentiated (Porter, 1985).

The ability of a firm to undertake these activities at a cost lower than its competitors gives it a competitive advantage. Value chain can be used as a tool to analyse the sources of competitive advantage of a firm (relative cost

position and differentiation), by systematically examining the activities performed by the firm. The value chain approach breaks into strategic units the activities performed by a firm to understand cost behaviour, differentiated activities and other activities with the potential of being differentiated (Porter, 1985).

Value chain is made up of "value activities and margins" the activities are both physical and technological. Through this, a product is produced by a firm for buyers. The difference between total value and the collective cost in undertaking a value activity is the margin. Value activities are either described as primary activities or support activities. Primary activities undertaken are the physical creation of a product, its' sale, distribution, and the provision of after sales service. These activities can be classified into five, inbound logistics, outbound logistics, operations, marketing and sales, as well as services. Support activities are focused on the acquisition and provision of inputs, procurement, human resource management, firm infrastructure, and technology development (Porter, 1985, pp. 38-39).

Furtherance to this, Kaplinsky and Morris (2001) outlined the key aspects of this concept to include the following activities that are carried out at links in the chain which were categorised into various stages of the process including supply (inbound logistics, operations, outbound logistics, marketing and sales, and after sales service). Transformation of the inputs into products or outputs (production, logistics, quality, and continuous improvement processes) and how the firm can achieve its set task through the support services (strategic planning, human resource management, technology development and procurement).

The authors noted that value chains can be simple if the chain is one or extended value chain when there are many links in the chain. Aside this, there is also one, or many value chains. If the value chains have "manifold links" with specific intermediary producers having to feed into many value chains that are different (Kaplinsky & Morris, 2001, p. 6). Value chains of individual firms are influenced by several factors such as the history, strategy, manner of implementation strategy and economics that back the activities (Porter, 1985).

Concluding, value chain analysis varies per how it is conducted, which is always influenced by reasons necessitating the analysis and the extent it is done. The focus of these analysis traditionally, has been "on inter-firm relationships" and between various actors in a firm, which can lead to value creation for their customers (Bair 2009 as cited in den Broeder, 2018, p. 20).

The Broiler Value Chain in Ghana

The broiler value chain in Ghana has been identified to include the following key activities that actors undertake; input supply (day-old chicks, feed, medication, feeders, etc.), production (birds can be kept up to 8weeks or more), marketing (live or dressed birds), processing (whole dressed birds, chicken cuts or parts) and provision of support services (Mensah-Bonsu et al., 2019). This study was focused on some aspects of the inputs, production, processing and the marketing chain of the local broiler value chain.

The domestic broiler value chain, like any other value chain enterprise or business, if well managed, can increase its profit share and also become competitive (Piboonrungroj et al., 2017). Increasing the competitiveness of the broiler value chain enterprise can lead to economic growth and industrialization with the benefits of job creation (Ncube, 2018).

The local broiler value chain has been described variously by different authors (Amanor-Boadu et al., 2016; Kwadzo et al., 2013; Mensah-Bonsu et al., 2019; Nti, 2018; Sumberg et al., 2013) in performance, prospects, and challenges as well as its ability to generate jobs. The ensuing review is focused on key aspects of the domestic broiler value chain.

Key Broiler Value Chain Actors and their Roles

Agricultural food chains have been defined from the socio-economic perspective as "a system that brings together economic and social stakeholders who participate in coordinated activities that add value to a particular good or service, from its production until it reaches the consumer. The chain includes providers of inputs and services as well as processing, industrialization, transportation, logistics and other support services, such as financing" (Garcia-Winder et al., 2009, p. 27). These social stakeholders or actors along agricultural value chains transforms inputs into products at every node of the chain.

In the context of the livestock sector particularly poultry value chains in Ghana, Sumberg et al. (2016) have identified the following key actors who may have competing interest; government ministries such as Ministry of Food and Agriculture (MoFA) and its agencies including Veterinary Services Directorate (VSD) and Animal Production Directorate (APD). Small and large-scale poultry producers, veterinarians, feed producers, input and equipment suppliers, livestock dealers (mature broilers or spent layer traders), transporters and butchers, and importers and distributors of live animals (day old chicks) and frozen chicken, consumers, investors and development partners.

Similarly, Mensah-Bonsu et al. (2019) have identified the following as actors along both broiler and layer value chains in Ghana; input suppliers, farmers (producers), wholesalers, collectors, retailers, processors, and consumers. These, the authors noted, were undertaking value added activities along the chain. Their socio-economic characteristics include gender, age, educational level, household size, primary and secondary occupations, and membership of associations.

Further to this, Mensah-Bonsu et al. (2019) reported that 90.7 percent of the producers were men, which was attributable to the fact that women lack the capital required for such an activity and the fact that it is also viewed as a strenuous activity and not ideal for women. However, the trading and processing segments of the value chain were dominated by women who constituted 89.2 percent and 84.4 percent respectively. It was also found that the actors fall in the category of the economic active population per their mean ages, as follows; producers (35.1), traders (39.8) and processors (32.1).

Input suppliers in the domestic broiler value chain have been critical players in the growth of the broiler sector. Some of these major production inputs including ground nut cake, fishmeal, premix, concentrate, soyabean meal, yellow and white maize. The rest are fertile hatchable eggs (FHE), parent stock, day-old chicks, vaccines, drugs and equipment's (feeders, drinkers, and cages) which are imported into the country (Bekoe, 2021).

Most of the poultry production inputs are supplied by private suppliers who have taken that role from government institutions. They mostly import and distribute these inputs to broiler producers across the country through a network of wholesalers or retail shops. Although some may have capacity

issues and the adequacy of supply networks, they play critical role in the sector. The availability of quality, affordable and consistent supply of inputs helps broiler producers realise their dreams. This aside, some input suppliers also provide extension and advisory services to poultry producers. All these are needed to increase productivity and innovation in the broiler sector (Gary, 2019).

In related study that described the actors of the poultry value chain in Enugu State, Nigeria, Udoye et al. (2019) used a structured interview schedule to interview 71 actors in the chain and identified service providers, poultry producers (broiler or layer), poultry processors, and marketers, and distributers as the main actors of the chain.

According to Udoye et al. (2019) the service providers on the poultry value chain render to other actors the following type of services; inputs provision including day-old chicks, feed, veterinary drugs, vaccines, and equipment (feeders, waterers, battery cage). The rest are extension and business development advisory services. For the producers on the chain, they produce the broilers for their customers including processors who dress the birds into whole or chicken cuts for sale. The marketers and distributors on the chain sell either live birds or dressed birds bought from the broiler producers to wholesalers, individual consumers, hotels/restaurants, and eateries.

Similarly, Akinwumi et al. (2012) identified the following as actors of the Nigerian poultry value chain; breeders and hatcheries, they supply day-old chicks to commercial poultry farms, and the link between poultry producers and breeders or hatcheries is the distributors of day-old chicks. Feed mills were categorised into three, major or branded feed mills, smaller feed mills,

and toll feed mills. Both the branded and small feed mills grind, mix, and package feed for poultry producers whereas toll feed millers only grind and mix feed ingredients brought to them by poultry producers for a fee. For the producers, the study identified four; backyard indigenous producers, backyard commercial producers, medium-to- large-scale commercial producers, and industrial farms like the FAO categorisation which stems from flock size and the adherence to biosecurity measures (Akinwumi et al., 2012).

In the broiler sector of Ghana's poultry industry, processing has been the bane of growth (Asante-Addo & Weible, 2019, 2020; Kwadzo et al., 2013). There is an absence of large-scale processing of broilers into dressed birds and chicken cuts or parts. The current state of broiler processing is done at a small-scale level with little or no automation.

The role of government as a key actor stem from the formulation of policies that give national direction to the sector as well as regulation and inspection duties for quality control that ensures checks and balances (Akoto, 2019; Ministry of Food and Agriculture, 2017, 2019).

Product Distribution Channels or Pathways

Following Ghana's economic growth successes, which moved the nation from highly indebted poor country to a lower middle-income status (Osei-Asare & Eghan, 2014). There is an ongoing "nutrition transition and increased consumption of protein-rich foods" which could result in a livestock revolution. Specifically, the following drivers are behind the changes of Ghana's "protein economy"; rising incomes, increasing urbanisation, lifestyle changes and national policy change (such as macro-economic policy, trade policy, agricultural sector policy and health policy), changes in the structure of

the global food economy, international trade regimes and technology (Sumberg et al., 2016, p. 918).

Poultry, fish, and cattle meat are most important protein-rich foods globally. Ghana imports all of these to augment the local shortfall in supply. The protein economy of Ghana should be seen as a revolution in the livestock sector and analysed in the broader context to include the production, trade, and consumption of protein-rich foods such as pulses, fish, meat, milk, and eggs (Sumberg et al., 2016). For the purposes of this thesis, the focus is on poultry (broiler) meat.

According to Asante-Addo and Weible (2020), the consumption of chicken meat in Ghana is influenced by gender, households with children, increased income, distance to the nearest chicken meat shop, availability, and convenience. The rest are employment status, house-hold income level, food safety consciousness, price sensitivity, quality, and ethnocentrism.

Similarly, Sumberg et al. (2016) reported that non-poor households were found between GLSS 5 and GLSS 6 surveys to have doubled their expenditure on poultry meat from 1.9 times to above 2.6 times. This suggests that per Ghana's poverty profile chicken meat is consumed more in urban areas than rural areas and more in southern Ghana than northern (there is less incidence of poverty in urban areas and southern Ghana compared to rural areas and northern Ghana).

It is, therefore, not surprising that Amanor-Boadu et al. (2016) and Andam et al. (2017) found that there were more poultry farms, businesses, and infrastructure in the southern parts of Ghana than in the northern part.

Indicating that, poultry production is mostly done in the south of the country and supplied to the northern part of the country.

For poultry meat, locally available data shows that chicken meat imports constitute about 97 percent of meat imports into Ghana. Mostly, from Europe (Netherlands, Belgium, and the UK), North America (the United States of America) and South America (Brazil). These imports come through the southern parts of Ghana, where the three main ports of entry (two harbours and one international airport) are located and then distributed across the country including the northern sector (Bank of Ghana, 2021; Sumberg et al., 2016).

The form or presentation of chicken in the market is either fresh or frozen and may include any of the following "live, whole-dressed, and parts such as leg quarters/thighs, wings, backs, and breast", averagely a whole-dressed bird weights 1.3kg (Asante-Addo & Weible, 2019). These are the forms in which poultry meat and products are distributed across the country.

The following are the channels or outlets in which broiler farmers sell their products in Ghana; hawkers, retailers, wholesalers, processors, chop bars and direct-to-consumer as well as "hotels, restaurants and institutions (HRI)". How a given outlet is selected by a broiler producer to sell products is influenced by factors such as the location of the farm or its' size and pricing (Amanor-Boadu et al., 2016, p. 18).

Among the channels of distribution of broiler birds, Amanor-Boadu et al. (2016) found that 69.9 percent of farmers sell their birds directly to consumers. Those who sell to HRI were 10 percent whilst to chop bars constituted 12.7 percent. For those farmers that use the wholesale channel,

they were made up of 27.3 percent whereas those who use hawkers were 25.9 percent and for processors, 1.8 percent. In the regional context, 46.8 percent of farmers in the Brong-Ahafo used the direct-to-consumer channel, whilst in Greater Accra and Ashanti regions, it was 69.3 percent and 60.8 percent respectively.

The opportunities for transporting poultry products in Ghana are limited (live birds, chicken meat and eggs). Live birds and eggs are mostly transported within Ghana by passenger vehicles. Generally, across Ghana there are no specialised vehicles for the transportation of poultry products. The few drivers that accept to transport poultry products especially, live birds do so by charging higher transportation fares (Mensah-Bonsu et al., 2019).

Whole-dressed or chicken parts (cuts) are transported in cold vans mostly operated by importers and frozen food distributors or marketers. These operators also deal in frozen fish. Similarly, there appear to be the absence of storage facilities for poultry products produced in Ghana (Mensah-Bonsu et al., 2019).

Challenges to Activities of Actors on the Domestic Broiler Value Chain

A challenge is said to be the "invitation or a call to action" (Beghetto, 2018). It is worth noting that despite the global appeal for broiler value chain products and its contribution to global and national economies, it still present both challenges and prospects (Mottet & Tempio, 2017). This has been studied and reported globally and in Ghana.

One such studies was conducted by Gulati et al. (2022) which used both secondary and field data to study the production, exportation, and pricing of commercial poultry products in India. The authors noted that small farm

size, unavailability of facilities for poultry processing, and lack of credible brands for the Indian chicken industry has affected its ability to export in large quantities. The small-scale nature of production by many producers was not economically viable due to high transaction costs (high cost of inputs such as feed, vaccines and transportation) and lack of adequate finance.

Gulati et al. (2022) added that the lack of processing, cold-chain infrastructure such as refrigeration, lack of government subsidies for actors, the unavailability of sector-specific insurance policy, the absence of animal welfare regulations, are all specific challenges confronting the broiler value chain in India. The rest are lack of traceability mechanisms or procedures for poultry products which affects food safety standards and quality of broiler production inputs. This makes it impossible for broiler producers to meet quality standards to qualify for export to some international markets.

Disease outbreaks such as Avian influenza and the failure of the Indian government to pay adequate compensation to broiler producers during disease outbreaks as well as the inefficient disease surveillance system were also noted as challenges of the broiler value chain (Gulati et al., 2022).

In studying the East African poultry value chain, Vermooij et al. (2018) outlined the following as key challenges that need attention to ensure the sustainable growth of the poultry value chain in the region; strengthening of poultry associations, marketing, transport and logistics, hygiene and biosecurity, cereal supply, feed, processing, infrastructure, parent stock, hatcheries and fertile eggs, DOCs, vaccines, electricity supply, and middlemen.

Unlike India which is reported to lack food safety and animal welfare laws or regulation (Gulati et al., 2022). In Europe, however, producers of poultry must adhere to laws protecting the environment from their activities, ensure animal welfare, food quality and safety (Van Horne, 2018). This comes with additional cost to producers and have become a conundrum to farmers in their quest to increase their margins while staying competitive in the market. This brings the issue of where to focus to achieve better output in the industry. Either to increase flock size or increase individual bird performance while ensuring food safety and environmental sustainability (Waker & Nääs, 2018).

Ghana's broiler value chain which was started in the early 1960s by government to provide nutrition and economic security is also confronted with a number of challenges. These have been identified by Sumberg, Awo, et al. (2017, p. 428) to include lack of competitiveness, high mortality rate, low productivity, and high cost of production. The rest are unfair competition, diseases, limited use of 'technology', cost of credit, cost of feed and other inputs as well as the 'dumping' of poultry products in the Ghanaian market.

Sumberg, Awo, et al. (2017) also noted that there are no government subsidies for Ghanaian commercial poultry producers. This is similar to what has been reported by Gulati et al. (2022) about Indian commercial poultry producers. On the contrary, poultry producers in the USA, Brazil and the member countries of the European Union (EU) benefit from subsidies provided by their governments to keep their cost of production low (Gbedemah et al., 2018).

Additionally, Onumah et al. (2021) studied the broiler value chain of three southern regions (Bono region, Greater Accra, and Ashanti Region) of

Ghana and identified the challenges confronting the broiler value chain actors through SWOT analysis. For processors, the small-scale nature of their operations, limited availability and access to improved technology, importation of frozen chicken, increase in tax by government, lack of access to capital and high cost of operation were noted to be threats to the growth of processors businesses.

On the part of producers, Onumah et al. (2021) outlined access to improved technologies and poor management challenges as major weakness whilst, importation of frozen chicken, increase in tax by government, lack of access to capital and high cost of operation as the main threats to the businesses of broiler producers. Distributors are also faced with the problems of access to improved technologies and poor management challenges which weakens their businesses. At the same time, they are also exposed to the threats of importation of frozen chicken, increases in tax by government, lack of access to capital and the high cost of operation.

Similarly, Tuffour and Sedegah (2013) in their study categorise the challenges of Ghana's broiler industry as financial, marketing and production related. The authors noted that, the challenges confronting broiler production in Ghana has been evolving over the years.

Chicken Meat Supply, Consumption and Consumer Behaviour

These challenges appear to have impacted greatly on the production capacity of farmers in the country. For instance, the total poultry meat consumption in Ghana from 2000 to 2010 is reported as 728,000 metric tonnes of this amount only 22.9% (167,000 metric tonnes) was produced in Ghana (United States Department of Agriculture, 2011 as cited in Tuffour & Sedegah, 2013). On the other hand, Nti (2018) reported that 67.48% of the chicken meat consumed in Ghana for the year 2014 were imported, it can be argued that the gap between domestic production and supply in Ghana is huge. This may be due to a shift by farmers from broiler production to layer production or a total collapse of their poultry businesses (Aning et al., 2008; Tuffour & Sedegah, 2013).

This shortfall in production to meet national demand for poultry meat have led to importation to satisfy demand. This has become a two-edged issue for stakeholders, it is viewed as a bane for the lack of growth in the Ghanaian broiler industry, as locally produced boiler is not able to compete with imported ones in terms of pricing (Gbedemah et al., 2018; Tuffour & Sedegah, 2013).

The price of imported chicken was between 25 percent to 30 percent cheaper than the one produced locally. This notwithstanding, a study by Al-Hassan et al. (2014) found that between the periods 2001 to 2010, locally produced chicken cost 60.41 percent more than imported chicken. Although the same, studies concluded that it was rather the origin but not price that influenced consumer preference. This makes it difficult for the marketing of locally produced broilers (Adei & Asante, 2012).

On the other hand, the need for protein nutrition is being met through the supply of cheaper chicken meat (whole dressed, cuts and parts) through importation (Sumberg, Awo, et al., 2017). This can be viewed as a positive output to some extent as it helps to address shortfalls in demand and ease the burden on the government.

The absence of large-scale processing facilities to process broiler produced in Ghana have impacted profoundly on the marketing activity of the value chain. One of the many studies that highlights this, was conducted by Kwadzo et al. (2013). They analysed the preference of consumers for broiler meat attributes in Greater Accra (Accra and Tema Metropolis) and Ashanti Region (Kumasi Metropolis). The study results showed that price was the most important factor to consumers, the rest are proximity, taste, and availability.

In a related study, Asante-Addo and Weible (2020) found that the highest consumers of chicken meat among their study population were restaurants, hotels, and fast-food joints. Also, it was found that when the following broiler meat attributes were used for the buyer benchmarking; "taste, pricing, packaging, proximity of access, availability and form of the output, from the customers' /consumers' perspective", domestic broiler meat only performs better than the imported one on taste but scored very low on all the other attributes in satisfying consumers.

Additionally, the study concluded that there was a significantly weak correlation between domestic chicken and imported chicken whereas food safety concerns encouraged consumers to eat domestic chicken, long distance travel to buy chicken meat discouraged the consumption of both domestic and

imported chicken. However, the ready availability of chicken meat encouraged the consumption of imported chicken. Higher prices discouraged the consumption of domestic chicken whiles increasing the consumption of imported chicken. Similarly, the perception that imported chicken was more convenient to use also increased the consumption of imported chicken compared to domestic chicken. The perception that domestic chicken was tastier, fresh and of high quality increased domestic chicken consumption whilst decreasing that of the imported chicken. At the same time there are some consumers who due to "ethnocentrism" are only consuming domestic chicken (Asante-Addo & Weible, 2020).

Poultry Sector Policies and Regulations

In value chain development, the issue of government policy, interventions, regulations, and levies or taxes are critical growth catalysts. These creates an enabling environment for businesses to strive (Vermooij et al., 2018). These types of government policy interventions in a sector can increase investments in businesses and export opportunities (Dlamini et al., 2014). Government interventions such as the introduction of import levies have the potential of increasing or lowering the competitiveness of broiler value chain businesses. The same is the microeconomic policy of a government such as exchange rate changes (Van Horne, 2018).

Regulations aimed at the poultry industry to ensure environmental safety, animal welfare, and food safety have been found to increase the cost of production (Van Horne, 2018). Similarly, Walton and Grishin (2018) reported that regulations limited the development, distribution, and adoption of technologies that would have helped propel the growth of agricultural value

chains, at the same time impede investment in agriculture and delay the transportation of agricultural products across borders thereby constraining trade and marketing of farm products.

Regulations of the EU require poultry farms with 40,000 birds and above to acquire an environmental permit for their operations, whilst those with 85,000 birds or above, to conduct an environmental impact assessment (EIA), and also develop a clear noise and odour management plan. The disposal of dead birds during a production cycle is also regulated. There is also food safety regulation that ensures that feed for animals is safe for both animal and human health as well as environmentally friendly. Additionally, there is a General Food Law that requires farmers, marketers, and other actors along the agri-food chain to ensure hygiene, traceability, and labelling, to reduce or prevent the suffering of animals during production, slaughter, or transportation. Animal welfare regulations has been developed and enforced across the EU. According to Van Horne (2018), these regulations that have been outlined adds 6.1% to the total cost of producing broiler in the EU.

Sumberg, Awo, et al. (2017) reported on how Ghana's policy on agriculture evolved over the years although the focus was on cocoa and other agricultural crops. These sectors received major projects aimed at boosting production, whilst there were no major government of Ghana project aimed specifically at increasing poultry production over the same period of the study.

Additionally, it was found that the poultry sector was challenged in the following: lack of trade policies that offer minimal protection to poultry farmers, unavailable mechanism that enables the gathering of data for the poultry value chain. This has serious implication for planning and policy

formulation. Where there was available data, it was always of poor quality with a confusing use of the word “poultry”. Policy formulation for the poultry sector also fails to recognise the different production systems and the fact that constraints faced by broiler producers are different from those of producers of layers (Sumberg, Awo, et al., 2017).

The study concluded that there was failure on the part of government in implementing its own policies and programmes aimed at developing the poultry sector which had been overshadowed by cocoa and other crops while government of Ghana neo-liberal trade and macro-economic policies have worsened the plight of the industry. Also, there was lack of vision and coherence in government policy for the poultry industry (Sumberg, Awo, et al., 2017). In essence, Ghana like the Republic of North Macedonia lacks a special policy initiative that is focused on developing the broiler industry (Grimes et al., 2019).

In view of the foregoing, it is not surprising that government of Ghana have implanted policies and programmes in recent times including the Ghana Broiler Revitalization Project [GHABROP] (Andam et al., 2017; Kpentey, 2014), planting for food and jobs (Ministry of Food and Agriculture, 2017) and Rearing for Food and Jobs campaign (Akoto, 2019), with little improvement in the persisting challenges of the broiler value chain.

Poultry Disease Outbreaks and Animal Health Care Services

Another critical area for the broiler value chain is disease outbreaks or occurrences that affect the growth of the industry, in terms of bird population and growth performance (Ayisi & Adu, 2016) as it affects the ability of birds to fully utilise feed resulting in economic loss (Ayim-Akonor et al., 2013).

Healthy birds have high feed conversion ratio than sick birds (Grimes et al., 2019).

This makes access to veterinary services a critical issue. No wonder the Ghana living standard survey round 7 found that of the total amount of GH¢25,906.91 million spent on livestock inputs by farmers 94.0% (GH¢24,357.38 million) of the amount was on veterinary related services such as vaccinations and medicine. Despite this, 74% of respondents in the same survey reported difficulties in getting veterinary services [vaccinations and medicine] (Ghana Statistical Service, 2019b). Aside from offering prophylactic and curative treatments to birds, technical advice from veterinarians also equips farmers on the early detection and identification of diseases leading to reduction in spread and mortality resulting from disease (Etuah et al., 2020).

These findings are consistent with what has been reported by Adei and Asante (2012) who found that among farmers interviewed, it was only 51.1% who had access to veterinary services as and when they invite officers at their cost to come and attend to their birds.

Adei and Asante (2012) identified the following as the major diseases confronting poultry farmers in Ghana particularly in the Dormaa poultry enclave; Chronic Respiratory Diseases (CRD), Newcastle, Coccidiosis, Gumboro and Diarrhoea. Among these diseases, CRD was ranked as the most prevalent with 62.2% followed by Newcastle disease with 24.4%.

However, in the Ga East District of the Greater Accra Region, Ayim-Akonor et al. (2013) in a study isolated and confirmed the Infectious Bronchitis Virus (IBV) from sick birds. Indicating the prevalence of Infectious

Bronchitis (IB) disease in the area with up to 64% prevalence rate. This was after obtaining 47 samples out of which 30 were found to be positive. IB is a disease of economic importance to the poultry industry and affects both broiler and layers. It affects the bird's ability to maximise or utilise the feed consumed, thereby reducing bird weight gain.

Similarly, Aning et al. (2008) reported that the most important disease affecting commercial poultry production in Ghana is Gumboro. On the contrary, Sumberg et al. (2017) opined that avian flu disease rather has become one of the challenges of poultry production in Ghana. This disease, also known as Highly Pathogenic Avian Influenza's (HPAI) first outbreak in Ghana occurred in 2007 (Aning et al., 2008; Ayisi & Adu, 2016). Available records from the VSD indicates that, it cost Ghana a total of US$4,297,790 in the prevention, control, and containment of HPAI during the first outbreak, whilst poultry farmers incurred a total cost of US$1.1 million through the provision of biosecurity on their farms (Aning et al., 2008).

Further to this, it was reported that some poultry businesses collapsed while jobs were lost after the HPAI outbreak in Ghana, due to the ban on the marketing of poultry products, although there was no data to back this claim. There were reports from VSD that indicated that demand for chicken meat and eggs reduced because consumers fear they would be infected by HPAI if they eat them (Aning et al., 2008). Similarly, McLeod et al. (2009) reported that poultry disease outbreaks affect the sale of poultry and poultry products.

Poultry Processing

The lack of broiler processing particularly on large scale is another setback for the sector. At a time when there is a diet change among Ghanaians,

evidenced by the increased consumption of processed foods, as shops across Ghana increased the presence of processed foods. Majority (about 70%) of these processed foods are imported despite long standing government efforts towards increasing agro processing in Ghana (Andam et al., 2015; Andam & Silver, 2016).

In a market survey conducted in Sekondi-Takoradi, Kumasi, and Tamale. It was found that between 6 and 14 percent of processed tomatoes were produced in Ghana. A related market inventory also found that of the poultry meat sold in the major markets in Ghana only "one out of 24 packaged" were identified to have been processed in Ghana (Andam & Silver, 2016).

There is increasing demand for meat and meat products which requires more meat processing plants. Either large-scale or small processing plants that meets both health and safety standards (Tuyishimire & Fudge, 2019). Ghanaians desire for convenient meat including wings, drumsticks, thighs, gizzard, and breasts. Contrary to the current situation in which whole dressed bird is the main form in which processed broiler is sold in Ghana (Etuah et al., 2021).

Although governments' long-standing interest in growing the agro-processing sector dates to the 1960s. Albeit, government policies has always been focused on technology and capacity improvement while failing to consider the quality and adequacy of raw materials supply required to feed the processing plants (Andam & Silver, 2016).

Hence, very little success has been achieved due to the low quality and unreliable supply of raw materials, and high transportation and energy cost.

Additionally, high cost of raw materials, high operational cost, and low production, and productivity of primary inputs. For instance, the cost of processing broilers in Ghana is 40 percent higher compared to the EU, mainly because of the cost of the live bird (raw material). Even though, agro processing has been viewed by policy makers to have the ability to transform Ghana into an industrial nation, the sector's growth comes along with the creation of employment, adding value to agricultural products and increases farmer's access to markets (Andam & Silver, 2016).

Ghana has not successfully established any of the three types of poultry processing mechanisms outlined by Fanatico (2003). These include on-farm, small scale, and large-scale processing. The on-farm is mostly done manually whiles the small scale may be a blend of manual and mechanical and the large scale fully automated. Angioloni et al. (2016) also noted that poultry processing can also be carried out on-farm or off-farm using a "traditional stationary plant" and in some cases a mobile processing unit.

There are different models of broiler processing, this includes the conventional model and non-conventional model. In the United States and Europe, the conventional processing of broiler includes establishing a large slaughterhouse for birds to be transported to for processing whereas the non-conventional model involves the use of a Mobile Poultry Processing Unit [MPPU] (Mancinelli et al., 2018).

For this reason, a study on the financial viability of a 500-chicken processing plant, to process chicken into cuts/parts (thighs, wings, breasts, and drumsticks) in the Ashanti region of Ghana, was carried out by Etuah et al. (2021) which found that the net present value (NPV) was GH₵ 581,537.95

(US$ 116,307.59), whiles benefit-cost ratio (BCR) was estimated at 1.06 and the estimated internal rate of return (IRR) was 303 percent. The results demonstrated that it was viable to operate a broiler processing plant with 500 bird capacity.

Small-scale poultry producers are mostly confronted with the problem of how "to convert their live birds into a processed food product that can be sold to consumers and restaurants" (O'Bryan et al., 2014). In addressing this gap, the Mobile Poultry Processing Unit (MPPU) has been introduced in the United States and Europe (Mancinelli et al., 2018). The MPPU is an affordable poultry processing unit that addresses both the absence of poultry processing facility to producers and the issue of a tailored solution to providing a processing facility to small scale poultry producers. Thereby connecting small-scale poultry producers to consumers (O'Bryan et al., 2014).

The MPPU model is worth adopting in the Ghanaian case as the output of producers are in the numbers that MPPU can process. The MPPU also addresses an emerging concern of Ghanaian chicken meat consumers, which is food safety concerns. The MPPU model, adequately addresses food safety and health related issues that ensures that quality and hygiene is not compromised (Mancinelli et al., 2018).

Access to Finance and Insurance Policy

Broiler value chain businesses are private sector led, for this reason access to finance is critical for growth and long-term sustainability (Gulati et al., 2022). This has been achieved by actors in so many ways depending on the individual actor. For instance, McLeod et al. (2009) reported that sources of

financing of broiler value chain businesses range from external credit, family loans or from other family-owned enterprise.

Similarly, Adei and Asante (2012) reported that poultry production activities were financed by individuals against getting credit from a bank. In their study, about 69% of producers in Dormaa were found to self-finance their production whiles 9% were financed by relatives, 19% through credit from banks, and 3% through other means.

Mensah-Bonsu et al. (2019) noted that a very minimal number of respondents undertaking different activities along the commercial poultry value chain were found to have access to credit, thus producer's 16 percent, trader's 15 percent, and processors 4 percent. The credit was sourced from commercial banks and micro-finance institutions, it must also be added that very few respondents applied for loans/credit. Banks view the poultry industry generally as a very risky sector, as such hardly give loans to businesses in the sector, but when they do the interest rate is always high or the collateral demanded is huge (McLeod et al., 2009). Like what has been reported by Gulati et al. (2022) that financing opportunities in the broiler value chain was biased toward actors owning assets.

To minimise the risk in the sector, there is the need for an insurance policy that is specific to the broiler value chain and related sectors. It appears, however, that at present, there is no insurance policy for the commercial poultry sector in Ghana despite the enormous potential it offers in helping businesses mitigate risk, commercial poultry business in Dormaa that were studied were found to be operating without insurance cover (Adei & Asante, 2012).

Research and Technology Transfer

One other way to help mitigate the risk in the broiler value chain is the uptake of research and technology. Since improvement in research and technology such genetic technology, has led to the development of early maturing birds that make efficient use of feed resources. As well as improvement in bird health and the management farms (Pym, 2013).

For instance, the length of time of raising poultry in the case of the USA has been reduced. In 1925, it took 112 days for broiler to reach market age. Currently, however, broiler reaches market age at 49 days (USDA, 2014 as cited in Unveren, 2019). This can be attributed to advances in genetics, selective breeding, and feed efficiency. While India has used advanced technology to improve the genetics of its broiler breeding stock and enhanced production techniques. Improved feed conversion ratio to address the problem of feed cost and enhance the competitiveness of the sector. India's feed conversion ratio improved from 2.2 in the 1990s to the current ratio of 1.65, credit to the improvement in genetics, feed quality, and veterinary care. There is also a reduction in disease outbreaks through technology-enhanced biosecurity measures (Gulati et al., 2022). However, the average broiler feed conversion ratio in Ghana is 2.28 (Chibanda et al., 2022).

At the same time, the health of broiler has improved leading to reduced mortality rates with birds reaching desired slaughter weight faster than ever before (Broiler productivity, 2018 as cited in Unveren, 2019). This reduction in the growing cycle of broilers implies a reduced use of production inputs such as labour, feed, and others (Unveren, 2019). This has been, the area that the government of Ghana has unsuccessfully focused on. That is, technology

intervention aimed at producing improved breeds of poultry (Sumberg, Awo, et al., 2017).

While neglecting the employment of technologies that enable the production of birds under control environment using air-cooling systems among others, competitive nations in the sector such as the USA, Brazil and the European Union are known to be doing that (Gbedemah et al., 2018).

Another important means of technology transfer in the broiler value chain is a contract-based production system called "chick growing agreement" or integrator model. The contracting is always led or initiated by an integrator who provides the production inputs and buys the output or products. The inputs include feed, day-old chicks (DOCs), vaccines, and veterinary services (Gulati et al., 2022).

The contract farmer in turn provides labour, land, equipment, housing, and caring for the day-to-day management of the birds. Contract farming is beneficial to farmers who lack access to market, capital, extension service, and technical knowledge. Farmers who participate in contract farming are assured of markets and acceptable prices while being insulated from risk. The use of the integrator model has improved the technology adoption of broiler producers and can be taken as an advantage to improve the productivity of actors on the chain (Gulati et al., 2022).

The Wider Appeal and Acceptability of Chicken Meat

Despite the challenges outlined above concerning broiler value chain businesses in Ghana, the future for the industry is bright as there is growing consumption of chicken meat globally and in Ghana.

Chicken is the second most consumed meat (Oliveira et al., 2012), fuelled by an increased in global demand for chicken meat (Jeswani et al., 2019; Nti,2018; Oliveira et al., 2012; Waker & Nääs, 2018). A trend attributed to increased population, urbanisation, and income growth (Abro et al., 2020; Carron et al., 2017; Jeswani et al., 2019; Mottet & Tempio, 2017), as well as the reduction in prices of chicken meat due to lower production cost in some countries (Waker & Nääs, 2018), and the availability of quick service restaurants (Vermooij et al., 2018).

Asante-Addo and Weible (2019) has demonstrated in their studies that chicken meat is an important aspect of the diet of many Ghanaians creating a continuous demand for chicken meat which would stimulate growth in the poultry sector. However, there are critical steps that must be taken to ensure that, the sector grows to what all actors along the domestic broiler value chain desire, such as addressing both demand and supply-side constraints.

Other authors including Unveren (2019) in contributing to the debate on the wide acceptability of chicken meat have attributed it to the fact that chicken meat is white in nature making it safe for people who are interested in healthy eating habits. This has made it to become the number one meat consumed in the USA compared to pork and beef.

Chicken meat account for 50% of the total meat consumed in Africa. Although it is viewed as a luxury in Tanzania to eat chicken meat, as it is more expensive than beef (Vermooij et al., 2018). On the contrary, chicken meat is a major source of animal protein in Pakistan, it is available, accessible, and cheap (Tahir et al., 2020). In Malaysia broiler meat is the most important and yet cheapest protein source consumed (Elsedig et al., 2015). Broiler meat is

the foremost source of animal protein and constitute 93.6% of the poultry meat produced in South Africa (Department of Agriculture, Forestry and Fisheries, 2013). The consumption of poultry meat in Kenya is projected to increase from the year 2000 to 2030 from 54.8 metric tonnes to 164.6 metric tonnes (Carron et al., 2017).

Whereas in Ghana, poultry meat is the most consumed, with a per capita consumption of chicken meat increasing from 1Kg to 3Kg between 1997 to 2010 (Tuffour & Sedegah, 2013). Contrary to this, Nti (2018), noted that from 1990 to 2015, the per capita consumption of chicken meat increased from 1Kg to 6Kg. Despite this disagreement in figures, what is clear is the significant increase over the period.

Also, based on data sourced from the Organisation for Economic Co-operation and Development (OECD), FAO and the Netherlands-African Business Council (NABC), Vermooij et al (2018) reported the following figures for per capita consumption of chicken meat. For the under-listed Sub-Saharan (SSA) countries including Ghana between 2009 and 2017 as shown in Table 1.

Table 1: Poultry Meat Consumption

Country	2009	2010	2011	2012	2013	2014	2015	2016	2017
Kenya	0,600	0,700	0,500						
Rwanda	0,200	0,200	0,200						
Tanzania	1,572	1,581	1,793	1,556	1,560	1,528	1,498	1,468	1,469
Uganda	1,600	1,800	1,800						
Ethiopia	0,516	0,593	0,529	0,573	0,577	0,563	0,549	0,536	0,534
Ghana	4,231	5,392	6,495	7,166	7,702	6,406	5,683	5,933	6,124
Nigeria	1,554	1,352	0,779	0,816	0,866	0,893	0,918	0,904	0,906
SSA average	2,060	2,254	2,312	2,395	2,390	2,433	2,249	2,135	2,132
Global average	12,398	12,822	13,147	13,239	13,227	13,313	13,667	13,787	13,860

Source: Adopted from Vermooij et al. (2018:13)

Among these 8 countries, Ghana had the largest per capita consumption figures with sustained increased over the years. At this rate of consumption, there is a huge demand for chicken meat and chicken related products. It, therefore, creates the opportunity for job and wealth creation through producing enough to satisfy the ever-increasing demand (Amanor-Boadu et al., 2016).

Given the fast-growing nature of the demand for chicken meat globally, there is high export potential for broiler meat and products within producing countries and abroad. Efforts such as identification of these markets and segregating for targeting with specific tailor-made chicken meat products such as breast meat, cuts, chilled or frozen is key to expanding the markets. Already existing markets must also be consolidated. A case in point is India, where 90% of chicken produced is sold in the live bird or wet markets as fresh meat whiles about 10% is processed as chilled or frozen chicken (Gulati et al., 2022).

The operationalisation of the African Continental Free Trade Area (AfCFTA) has created a large market for broiler value chain actors to sell their products. Already, Chibanda et al. (2022) has reported that 42% of broilers produced in Accra, Kumasi and Dormaa in Ghana were exported to Cote d'Ivoire and the remaining is disposed off within Ghana as follows; 14% is sold directly to consumers, 10% sold to processors, 30% is sold to distributors or wholesalers and 2% to retailers. This export market can be taken as an opportunity to increase production.

Competitiveness and Integration of the Domestic Broiler Value Chain

Agribusiness competitiveness is viewed from both the microeconomic level or firm and macroeconomic level or national (Babu & Shishodia, 2017). In business context, Kennedy et al. (1998) have defined competitiveness as *"*the ability of a business to profitably create and deliver value at prices equal to or lower than those offered by other sellers in a specific market" (p. 247). Specific to agribusinesses, Babu and Shishodia (2017) postulate that "agribusiness competitiveness at the micro level is a firm's ability to constantly produce agricultural products to meet the demand of the open market. At the macro level, a nation's policies, institutions, infrastructure (physical and human), and resource endowment determine its competitiveness in agribusiness" (p. 3).

The rule governing this definition is that competitive advantage can be absolute or relative. A competitive agribusiness must be characterised by "specialized production technology, institutional reform, and commercial farming systems" (Babu & Shishodia, 2017, p. 7). In relation to broiler value chain businesses, Waker and Nääs (2018) observed that to be competitive the cost of production must be low resulting in low prices of chicken meat and associated products. Additionally, Elsedig et al. (2015) also opined that, a competitive broiler value chain business must also win itself from government intervention whiles cost of production inputs such as feed (maize and soy) is low.

Other features of competitiveness include high feed conversion efficiency of birds, technological advancement in the broiler industry, high performing broiler breeds due to genetic and nutritional improvement as well

as the adoption of improved management strategies (Oliveira et al., 2012). Similarly, Waker and Nääs (2018) in a study concluded that the broiler production industry in Brazil has improved over the years through technology and coordination and has become very competitive globally.

The rapid growth of Brazil's broiler industry is linked to increased production in large-scale, vertical integration and contract farming. These have made the industry competitive through the lowering of production cost and increased in efficiency (Valdes et al., 2015). This has been collaborated by Unveren (2019) noting that Brazil and the USA are considered the most efficient broiler producing countries globally as such very competitive due to the vertically integrated system of production, which allows producers to control two or more stages of the value chain.

According to the National Chicken Council (2021) a vertically integrated broiler production business is one that combines the different stages of production along the broiler value chain, such as feed mills, hatcheries, farms, processing, and marketing under one business. This is mostly achieved through integrators coordinating production at the different stages of the value chain to ensure their combination under a single business. The "integrator" model of broiler production was developed in southern USA (Sumberg, Awo et al., 2017).

The benefits of this type of approach to businesses are reduced production cost and increased technology up take as well as reduction in production time (Carron et al. 2017; Oliveira et al., 2012; Unveren, 2019; Waker & Nääs, 2018). It also enhances food safety through the adoption of tighter biosecurity and sanitation measures as well as the use of "all-in-all-out"

production system. Compared to keeping birds of multiple ages (Ayim-Akonor et al., 2013). While making available to actors of the chain advance technology (Elsedig et al., 2015)

Generally, in agricultural value chains, vertically integrated farms enjoy the advantage of economies of scale and the synergies associated with technology and skilled workers as well as access to credit, the management of the financial, logistical, and marketing activities (Walton & Grishin, 2018).

In Ghana, Aning et al. (2008) reported on Afariwaa and Asamoa-Yamoa farms previously providing production inputs such as feed, day old chick to satellite farms around their processing plants. And afterward the farmers supplied the mature birds to them for processing. However, the authors admitted that it did not work well.

More recently, Mensah-Bonsu et al. (2019) reported contractual relationship among actors in Ghana's poultry value chain. Among the respondents, about 60 percent of producers, 28.9 percent of processors and 61 percent of traders were found to have entered verbal contracts (94%) with other actors along the chain. A case in point is the few broiler producers in the Dormaa and Sunyani districts who were found to have entered contractual agreement with Fony Services in Cote d'Ivoire. Though the broiler producer's contract was with an input supplier which is always written, the layer producer's contract was with traders who buy their eggs and not always written, just by word of mouth.

The report of Aning et al. (2008) and Mensah-Bonsu et al. (2019) remain the only know reported attempts in contract farming in the domestic broiler value chain. However, Ragasa et al. (2018) reported contract farming

in maize production. Contract farming approach was found to have helped maize farmers adopt new production technology but with negative profit margin. The seemingly little use of contract farming in Ghana's broiler value chain, has denied the country the opportunities it offers including the delivery of quality and sufficient inputs, new technology and technical services as well as guaranteed markets.

Similarly, very little is known about integration of broiler production businesses in the country. Aside, a study that assessed the poultry feed sector in Ghana and identified 14 farms that had feed mills integrated into their production systems (Andam et al., 2017), and an earlier study by Aning et al. (2008) that identified five integrated poultry farms in Ghana, these farms had a hatchery, feed mill, poultry production, marketing and some included processing units.

Despite the enormous benefits it offers to actors along the value chain that ensures the competitiveness of the industry, Government of Ghana initiative on integration as observed by Sumberg et al. (2017) from the 1960s to 2013 was only in the 2010 Medium-Term Agriculture Sector Investment Plan (METASIP) document and was more general targeting agricultural products.

Farm size has also, been found to influence cost of production and gross margins, this has a positive impact on competitiveness. Poultry farms in Ghana with large bird population has lower average cost of production and higher gross margin compared to smaller farms (Andam et al., 2017; Nti, 2018). Similarly, Dziwornu (2014) reported that small scale poultry businesses that produced according to their entire installed capacity recorded a reduction

in production cost. Additionally, Etuah et al (2020) reported that broiler farmers who produced large numbers of birds had lower production cost than those with small numbers.

Vertical integration is one of the reasons the USA is a global leader in broiler production and Brazil the foremost exporter of chicken meat to other countries in the world (Oliveira et al., 2012; Nääs et al., 2015; Unveren, 2019; Van Horne, 2018; Valdes et al., 2015; Waker & Nääs, 2018). It also explains why the African continent only account for 5% of the global poultry meat production, despite the continent having 15% of the global population which is expected to reach 25% in the year 2025 (Etuah et al. 2020; Vermooij et al., 2018) since there is lack of integration and contract farming in the broiler value chain of many African countries including Ghana.

Cost Drivers in Domestic Broiler Production

According to Porter (1985) cost is critical to firms for a number of reasons including the fact that cost advantage is one of the competitive advantages a firm is likely to have, and it also informs a firm's strategic decision to undertake differentiation since the differentiated cost must be at par with that of competitors.

For this reason, most firms strategically focus their attention on either "cost leadership" or "cost reduction". Cost items may include direct and indirect labour, raw materials cost, marketing, infrastructure, and services as well as manufacturing or production. These drive the behaviour of cost of any given firm. Therefore, "cost drivers are the structural determinants of the cost of an activity" and how firms control cost may differ (pp. 62-63). Cost is the monetary value of either labour, raw materials, time, goods, and risk as well as

lost opportunities incurred towards the production or delivery of a good or service (Porter, 1985). It can be fixed or variable when considering production related cost.

In the case of the poultry industry, particularly the local broiler value chain. Many activities and items drive or influence cost. For instance, the number of days or weeks broilers are raised and ready for market or for the slaughterhouse impact on the production cost (Dziwornu, 2014). This suggests that the age of birds is important to production cost. However, it varies from one country to the other, for instance, the maturity age of broiler in Brazil is 42daays (6 weeks), at this age they are ready to be slaughtered (Oliveira et al., 2012; Waker & Nääs, 2018). However, Carron et al. (2017) in a study found that boiler was considered matured between 33 and 36 days (about five weeks) in Kenya.

The ideal situation in Ghana is to have birds in the market at 6 weeks at a dressed weight of 2.0 kg. However, among the farmers studied only 2.3 percent were able to sell their birds at 6 weeks, 45.2 percent sold between 6 and 9 weeks. The remainder (52.5%) sell their birds at 9 weeks or beyond. For small farms, the average age of birds at sale was 9.6 weeks, whiles that of medium scale farms was 8.7 weeks and 7.9 weeks for large scale farms respectively. Across Ghana, Brong-Ahafo had the lowest age of sale of birds at 8.6 weeks (Amanor- Boadu et al., 2016).

However, Adei and Asante (2012) stated that broilers take 49 to 56 days to mature. Similarly, Dziwornu (2014) also noted that in Ghana the expected length of time to raise broiler to maturity is between 42 and 56 days. However,

Etuah et al. (2020) reported that it takes 8.71 weeks (61 days) for broiler raised by small scale producers in the Ashanti region to reach maturity.

Production inputs such as feed cost accounts for 66% of the total cost of producing broiler in Brazil (Waker & Nääs, 2018). In Malaysia feed cost constitutes about 70% of the cost of producing broilers (Elsedig et al., 2015) whilst in East African feed cost accounts for 80% of total cost of production (Vermooij et al., 2018). Similarly, Nkukwana (2018) reported that feed cost constitutes 75% of the total production cost in South Africa.

On the contrary, Dziwornu (2014) found that feed accounted for 51% of the total variable cost of broiler producers in selected districts in the Greater Accra region, Ashanti and Brong-Ahafo regions of Ghana. Additionally, feed cost constitutes over 60% of the cost of producing broiler in the Ashanti region (Etuah et al., 2020). Higher feed cost implies a smaller margin for the producer and a possible higher cost for the consumer (McLeod et al., 2009).

To this end, Etuah et al. (2020) studied the varying levels of cost inefficiencies among small-scale broiler farmers in the Ashanti region and why it was so. The stochastic cost frontier model was employed, and it was found that 13.6% of the cost of production can be avoided by farmers. For this reason, farmers can reduce the production cost on their farms without changing the technology being used. It was also found that the years of experience a farmer has in poultry production helps in reducing cost of production, the many years of experience, the more cost efficient a farmer becomes in his production. Whiles membership of the poultry farmers association equips farmers technically on poultry production techniques

enabling them to reduce their cost of production. The study concluded that broiler farms in the study area were generally cost inefficient.

Cost can also result from administrative actions, such as the imposition of importation levies by the government on some poultry production inputs including veterinary drugs (Aning et al., 2008). Utility charges as in high cost of electricity will drive up the cost of processing and storage (Aning et al., 2008). It can also be attributed to regulations that help to ensure quality inputs for poultry producers (Vermooij et al., 2018).

McLeod et al. (2009) opined that problems from management of the environment or the attempt to adopt better environmental management practices can also drive-up production costs for broilers. Although in Ghana, very little is reported on this, it is a well-known fact in Europe and North America.

This notwithstanding, there are also some activities that when undertaken reduce cost. Elsedig et al. (2015) employing the policy analysis matrix (PAM) for a study which concluded that despite importation of major feed ingredients (maize and soybean) for broiler production in Malaysia, the broiler industry was very competitive due to some other factors such as the use of advance technology.

Spreading the cost of production by utilizing the installed capacity of a farm's infrastructure has the potential of lowering the cost (Dziwornu, 2014). Similarly, Unveren (2019) reported that economies of scale and technological improvements in the USA chicken industry have led to lower prices of chicken compared to pork and beef, making it affordable to consumers.

Dziwornu (2014) identified feed cost, day-old chick cost, labour cost and market age of broilers as well as capacity utilization to be the factors that can have adverse or positive impact on the competitiveness of broiler production in selected districts in Ghana. Subsidies are also one other area that increase or lower the cost of production. For instance, poultry farmers in the EU are given subsidies by their governments to help them produce at lower prices (Ayisi & Adu, 2016).

Examining Gross Profit in the Major Activities of the Broiler Value Chain-An Empirical Review

The goal of every agribusiness is to maximise profit to achieve satisfaction. Profit, therefore, is said to be "the difference between the revenues obtained from what is sold and the costs incurred in producing the goods" (Debertin, 2012, p. 4). Profit in agricultural value chains may be calculated as net farm income (NFI) or gross margin (GM). The difference between NFI and GM is that fixed cost is included in NFI analysis but exempted from the analysis of GM (Amanor- Boadu et al., 2016; Boakye, 2020; Onumah et al., 2021).

The main product from broiler producers is live birds sold to the various buyers and done in numbers mostly not by weight. The average price of broiler in Ghana has been found by Amanor- Boadu et al. (2016) to be inversely proportional to "the scale of the broiler chicken farm" (p. 21). The average price (GH¢ 33.17 per bird) of large farms were lower than the average prices (GH¢ 35.11 per bird) of small farms (Amanor- Boadu et al., 2016).

However, the broilers produced are a product of both variable and fixed cost, which determines the profit of the major activities of the broiler

value chain. Various authors have identified these two types of cost. Andam et al. (2017) listed the cost items of producing poultry in Ghana to include: feed, salaries, electricity, water, communication, local government levies, land rents, food for workers and transportation. Similarly, an earlier study by Al-Hassan et al. (2014) also identified cost of feed, feed additives and energy.

On the other hand, Amanor- Boadu et al. (2016) identified the following as variable cost items in local broiler production: day-old chicks, labour, feed, and veterinary services (cost of drugs, vaccines, laboratory services, disease treatment and prevention, equipment's and service charges)

The total variable cost per bird (labour + veterinary + day-old-chick +feed) was found to be GH¢ 24.91 with GH¢ 4.21 differentiating small-scale farms from medium size farms. For that of medium size farms and large-scale farms the difference was GH¢ 2.81. Based on this, the average gross margin per bird was calculated as GH¢ 8.87. Relating this to farm size, small farms had GH¢ 8.64, whiles medium-size farms had GH¢ 10.34 and that of large farms was GH¢ 10.49. However, a percentage of the farms recorded negative gross margin. Among the small farms 14.5 percent recorded negative gross margin whereas "6.5 percent of medium-size farms and 3.8 percent of large farms" respectively (Amanor- Boadu et al., 2016, p. 33).

Boakye (2020) studied Ghana's pineapple value chain in selected districts of the Central region, and reported that, the per acre average pineapple fruits produced per farmer was 14,781, whilst the average gross profit received was GH¢ 15,631. Two farmers did not break even whilst 138 farmers received profits that ranged from GH¢ 10001 to GH¢ 20000.

However, the average profit received by pineapple processors was found to be GH¢ 15,681.3 per every 14781 pineapples processed. Also, 22 of the processors were found to be either making losses or at the break-even point whilst 46 processors made profit of GH¢ 10,001 for every 14,781 pineapples they processed (Boakye, 2020).

Similarly, results from the gross margin analysis of pineapple marketers show that 109 of them either break-even or are making losses whereas 36 pineapple marketers received a profit ranging from GH¢ 1 to GH¢ 10, 000, less than 24 of them received a profit of GH¢ 10,001 or more. For an average sale of 14,781 pineapples, the loss incurred by marketers was GH¢ 134.3. Among the key pineapple value chain activities analysed, marketing of pineapple was not profitable but farming and processing were profitable (Boakye, 2020).

On how profit was shared among the actors along the pineapple value chain, the Kruskal-Wallis test was used to compare the share of profit among actors. The results demonstrated that, there were significant difference in the profit share of actors. Farmers recorded the highest score (87.5%), followed by processors (77.1%) and lastly marketers (4.4%). A further test of significance among actor's profit share using Mann-Whitney U Test shows no significance difference between producers and processors but there were significant differences between producers and markers as well as between processors and marketers (Boakye, 2020).

Examining Profit Efficiency in the Major Activities of the Broiler Value Chain-An Empirical Review

It is important to note that there are profit efficiency issues along the domestic broiler value chain. Which can only be ascertain through profitability analysis. Generally, profitability analysis includes GM or NFI and the estimation of productive efficiency or input-oriented efficiency measurements. These are technical efficiency, scale efficiency, cost efficiency, and allocative efficiency (Nti, 2019). However, the analysis of production inefficiency is done using technical efficiency, scale efficiency, and allocative efficiency (Rahman, 2003).

The factor by which the level of production of a firm is less than its frontier output is the firm's technical efficiency (Battese, 1992). An increased in the production efficiency level of actors of the domestic broiler value chain would mean more productive resources availability to actors (Rahman, 2003).

Different authors have used different econometric models to study profit efficiency in agricultural value chains. Among these studies include Rahman (2003) who used the translog stochastic frontier profit function to study modern rice farmers in Bangladesh and found that only the fertilizer price had a positive relationship with gross profit and was significant at 5%, therefore, increases the profit efficiency of rice farmers while the labour wage, animal power price, and seed price were all significant at 5%, and pesticide price was also significant at 1% but made famers profit inefficient as these variables had a negative relationship with gross profit.

Among the factors that predicted inefficiency among the rice farmers, experience growing modern variety and soil fertility were found to be

significant at 10% and have a negative relationship with profit inefficiency as such reduce profit inefficiency among farmers while tenancy was significant at 10%, infrastructure was significant at 1%, and non-farm income was significant at 5%, all increases profit inefficiency among the farmers (Rahman, 2003).

Similarly in studying maize farmers in Ghana, Wongnaa et al. (2019) who also used the translog stochastic frontier profit function reported that, aside capital which had positive relationship with gross profit and was significant at 1% and increases the profit efficiency of farmers. The other variables; size of household, price of manure, price of fertiliser, price of agrochemicals, price of maize seed were all significant at 5%, while price of labour was significant at 1% all these had a negative relationship with gross profit hence reduces maize farmers' profit.

However, the study found that among the predictors of profit inefficiency among the maize farmers, farms located in northern savannah was significant at 1% and, forest zones was significant at 5% and increases profit inefficiency among farmers as they had a positive relationship with inefficiency while seed variety used, access to credit, contact with extension officers, years of schooling, farm located in forest zone, and good roads where all significant at 1% and gender was also significant at 10% but all these had a negative coefficient and was found to reduce inefficiency among farmers (Wongnaa et al., 2019).

In a study that used the Cobb-Douglas production function to estimate the effect of inputs on gross profit of pineapple farmers, processors, and marketers. Reported that the farmers' revenue, capital, cost of agro-chemicals,

cost of planting materials and cost of labour all influenced the farmers profit up to 75 percent whereas processors revenue, cost of pineapple fruits used, cost of packaging materials used, cost of labour employed, and capital were the cost they received that influenced their profit up to 33 percent. On marketers, the earned income, cost of loading, off-loading, cost of transportation, packaging cost and cost of storage were the cost they received that influenced their profit up to 70 percent (Boakye, 2020).

Tijani et al. (2006) used the Cobb-Douglas production function model to study the profit efficiency of broiler producers in Nigeria, they found that the price of drugs was significant at 10%, and wage rate was significant at 5% and both had a negative coefficient and reduced profit efficiency among broiler producers in Nigeria's Aiyedoto farm settlement. While farm size had a positive coefficient and was significant at 1% and increases the profit of broiler producers. It was also found that access to credit had a positive relationship with profit inefficiency and was significant at 1%, making broiler producers more profit inefficient while education in years had a negative relationship with profit inefficiency and significant at 1% thereby reducing the profit inefficiency among the broiler farmers in the study area.

Yevu and Onumah (2021) studied profit efficiency in layer farms in the Greater Accra and Brong-Ahafo regions of Ghana and found that price of day-old chick, price of medicine/vaccines, and capital cost all had positive coefficients with the price of day-old chick being significant at 10% while price of medicine/vaccines and capital cost were also significant at 1% implying that they all increase the profit efficiency of producers. However, the price of feed and that of wage labour were both found to have negative

coefficient and were significant at 1% implying that they all reduce the profit efficiency of layer farmers in the study area.

The maximum likelihood estimates (MLE) of the profit inefficiency model show that age and experience were significant at 5% while housing type was significant at 10% and mortality rate was significant at 1% all with positive coefficient implying that they increase inefficiency among the layer farmers in the study area, whereas gender, Age*Experience, training in poultry farming, and extension contact were all significant at 1% with membership of farmer based organisation (FBO) significant at 5% but all having a negative coefficient, thereby having a negative relationship with profit inefficiency hence reduces profit inefficiency among the respondents (Yevu & Onumah, 2021).

Dziwornu and Sarpong (2014) studied profit efficiency among small-scale broiler producers in the Greater Accra region of Ghana using the Cobb-Douglas profit frontier model. The study found the price of other costs, capital input cost, dummy variable for hired labour (DHL), dummy variable for family labour (DFL), price of DOC, price of feed, the wage of hired labour, and imputed wage of family labour all to be significant at 1% and their coefficients were negative implying that they have a negative relationship with gross profit as such made broiler farmers profit inefficient.

The study also found the variables determining economic inefficiency in small-scale broiler production to include; the age of the broiler farmer and the market age of the broiler, both were statistically significant 1% and has a positive sign implying that they both made broiler farmers to be profit inefficient while extension service contact and access to credit had a negative

coefficient and significant at 1% as such reduces inefficiency among broiler farmers thereby making their businesses profitable (Dziwornu & Sarpong, 2014).

Similarly, Chibanda et al. (2021) studied the profit efficiency of smallholder broiler producers in Kabwe District of Zambia and reported that the Cobb- Douglas frontier profit function estimated coefficients of the parameters of profit efficiency show that cost of chicks, and cost of labour both had a positive coefficient and were significant at 1% and 10% respectively. However, the cost of feed had a negative coefficient and was significant at 1%.

The MLE of broiler farmers inefficiency in the study area were experience, extension visits, and birds now (flock size), these variables all had a positive coefficient and significant at 10% thereby making the farmers profit inefficient while gender had a negative coefficient and significant at 10% and increases the profit efficiency of the farmer (Chibanda et al., 2021).

In a study that evaluated the technical and allocative efficiency of poultry production in Rwanda, Hirwa (2018) found the determinants of technical efficiency to include vaccine unit, housing size, asset function, asset units, initial chicken units, current chicken units, feeding intake, hired labour, and family labour, and these were all significant at 10% but, housing size, asset units, feed intake, and family labour had negative coefficients implying that they made poultry farmers to be technically inefficient while the rest had positive coefficient making the farmers more technically efficient.

The estimates of allocative efficiency include vaccine unit, housing size, asset function, asset units, initial chicken units, current chicken units,

feeding intake (kg), and hired labour while vaccine unit was significant at 5% the rest were all significant at 10%. Also, vaccine unit and asset units all had a negative coefficient thereby reducing the allocative efficiency of farmers, but the rest had a positive coefficient and increases the allocative coefficient of farmers (Hirwa, 2018).

The study also found that the estimated predictors of technical inefficiencies were farmer income, household size, and farmer sex, these all had positive coefficients while household size was significant at 1% and the other two variables at 5%. These increase technical inefficiency among farmers but the variables chicks input market, source of information, eggs market channel all had negative coefficients and chicks input market was significant at 1% while the rest were significant at 10%. However, the estimated predictors of allocative inefficiencies were, chicks' input market, farmer sex, and farmer age whereas farmer sex had a negative coefficient and was also significant at 1%, that of farmer age had a positive coefficient and chicks' input market negative coefficient but both significant at 5% (Hirwa, 2018).

Relatedly, a study that measured the production efficiency of Kenya's smallholder milk producers using the Cobb-Douglas model. Nganga et al. (2010) found that the factors that determine profit efficiency among farmers were feed cost which was significant at 1% and drugs cost which was significant 5% both had a positive coefficient implying that they increased the profit efficiency of farmers. On the contrary, the factors that affected inefficiency were age, education in years, experience, and farm size all were

significant at 1% but age had a positive coefficient implying it increases inefficiency among the farmers while the rest had a negative coefficient.

In examining poultry feed marketers' performance in Nigeria's Delta State using a regression model, the authors found that the factors which influence marketing efficiency among the respondents were; buying price of poultry feed, selling price of poultry feed, handling charges, transportation, market charge, cost of shop, level of education, experience and quantity sold. Transportation and quantity sold were significant at 1% while the rest were significant at 5%, also the coefficient of buying price of poultry feed, transportation, and market charge were negative all others had a positive coefficient (Gbigbi & Chuks-Okonta, 2020).

Ayieko et al. (2014) analysed the marketing efficiency of indigenous chicken markets in Makueni County of Kenya using a multiple regression model and found that the variables that influence efficiency of marketing were age, marketing cost, profit, consumer price, marketing margin, number of intermediaries, and group membership. The marketing cost and consumer price were significant at 1% while age, profit and marketing margin were also significant at 5%, the group membership and number of intermediaries was, however, significant at 10%. The coefficient of marketing cost, profit and number of intermediaries were negative, and the rest were positive.

Effects of Perceived Knowledge on Youth Engagement in Agribusiness and Broiler Value Chain Activities as a Vocation

Although perceived knowledge is not wholly derived from the amount of information an individual has, it has been defined as "the amount of persuasive information in a particular direction one believes one has about a

target stimulus" (Tormala & Petty, 2007, p. 18). Perceived knowledge shapes individual cognition and influences their decision-making (Radecki & Jaccard, 1995). It is critical in all areas of life, including farm-level activities where it may influence the managers decisions (Moffo et al., 2020). Among students, perceived knowledge in their study programmes and courses has been reported to influence their carrier choices (Afful, 2019; Amani, 2013; Mtemeri, 2017).

However, direct, and indirect methods are used to assess learning outcomes, in this regard perceived knowledge. Whereas the indirect assessment relies on self-assessment, the direct assessment does not (Peffer & Davis, 2018). But the self-reported assessment of one's knowledge level and skills accurately has been challenged and critics claim there may be biases involved, thereby, compromising the validity of the usage of such data. Indeed, evidence abounds empirically in explaining why individuals may fail to accurately acknowledge their abilities (Heath et al., 2012 as cited in Peffer & Davis, 2018). However, some other studies have also demonstrated the ability of individuals to make an accurate self-reported assessment of their knowledge level and skills, particularly among high and low-performing students (Ziegler & Montplaisir, 2014).

Ghanaian university students studying agriculture and agriculture-related programmes are taught poultry production as part of a course in mono-gastric production in the second year of their programme of study. Some studies have reported that youth who have knowledge of certain agricultural value chains, often tend to choose activities along them to undertake as a vocation by setting up their own businesses or serving as employees. These studies include Kodom et al. (2022) who reported on youth in selected cocoa

growing communities' interest in cocoa value chain activities following the acquisition of knowledge in the cocoa value chain. Similarly, Shayo et al (2020) also found that knowledge in agriculture through education influenced the youth to choose agriculture as a carrier.

In a study to identify factors that motivate students in Nigeria to study agriculture at the undergraduate level, Inegbedion and Islam (2020) used questionnaire to collect cross sectional data from 967 students in four (4) universities. The motivation of students was measured using a five (5) point Likert-scale. The results showed that, parental influence had the lowest mean score (2.59) while the acquisition of entrepreneurial skills and self-employment after graduation had the highest mean score (4.52). This implies that student's choice to study agriculture was not influenced by their parents and the purpose for which they were studying agriculture was to continue with it as employment after graduation.

Few known studies have been reported on perceived knowledge in selected subject areas including Peffer and Davis (2018) in Ohio State University that examined the relationship between students enrolled in intermediate, and advanced core animal sciences courses perceived and actual knowledge across skill level. Also, the study by Eija et al. (2017) who studied how perceived knowledge relate to actual knowledge among student teachers from Finnish university that were teaching biology in the primary schools. As well as the study by, Boswell (2013) on the perceived knowledge of undergraduate students on research methods from South Western United States.

Influence of Perception on Youth Engagement in Agribusiness and Broiler Value Chain Activities as a Vocation

The perception a person has on an issue or a subject influences the decision, they make on the issue. Similarly, perception has been one of the driving forces of the engagement of the youth in agricultural value chains.

Kodom et al. (2022) assessed the impact of the MASO Programme in changing the negative perception of youth between 17 to 25 years old on taking up cocoa farming as a carrier in some cocoa-growing communities in Ghana. Perception is reported to influence the choices young people make regarding entrepreneurship. Through focus group discussions, data was collected on the perception of MASO project beneficiary youth and adults in the communities who were not part of the project.

Results of the study showed that the perception of the youth before their involvement in the MASO programme included the following: farming was perceived to be for people without good carrier prospects and school dropouts. Farming, particularly cocoa, was generally viewed by the youth as an activity that keeps people in poverty, whiles female youth saw cocoa farming as the preserve of males. Parents in beneficiary communities encouraged their children who dropped out of school to move to urban areas or cities to search for jobs or learn a trade, irrespective of the child's interest in farming, as the parent couldn't make it economically in farming (Kodom et al., 2022).

These negative perceptions, however, have been changed following the participation of the youth in the MASO programme. The major contributory factor to the change has been the knowledge and skills acquired by the youth

on cocoa farming through the demonstration farms that were set up by the project. The youth now believe that cocoa farming can economically transform their lives with the skills and knowledge they have acquired through the MASO demonstration farms. Despite the new interest by project beneficiary youth to venture into cocoa farming, challenges abound on their way to enter cocoa farming including land acquisition and access to finance (Kodom et al., 2022).

A study by Bosompem et al. (2017) used a five-point Likert scale with 12 statements that measured the disagreement or agreement on perceived statements that negatively affect the agri-business environment and the willingness of undergraduate students to enter agribusiness as a self-employment venture. The authors revealed that students perceived accessibility and availability of market for agro products (mean = 3.27, std. = 1.03) to positively influence their willingness to enter into agribusiness as self-employment. However, high market competition of agro-products with imported products (mean = 2.32, std. = 1.12), unstable prices of agro-products (mean = 2.38, std. =1.14), absence of insurance in agribusiness (mean = 2.48, std. = 1.23) and un-favourable land tenure arrangement (mean = 2.52, std. = 1.08) negatively influence the willingness of the undergraduate students in starting their own agribusiness after school.

Mwaura et al. (2015) in a study that examined the awareness of country-level 'youth in agriculture' policies and programmes and the willingness of educated youth to take agriculture as a vocation. The study revealed that young Ghanaians are interested in salaried jobs rather than

starting their own business in agriculture mainly because the business environment in agriculture is not friendly and attractive.

Mwaura et al. (2015) further explained that young people in Ghana agree that the agriculture sector can provide sustainable employment for them but are reluctant to take up agriculture as an occupation due to the challenges and constraints that confront the sector. Young people in Ghana acknowledge that agricultural value chains have decent and numerous job opportunities for them. However, the perceived risk in the agricultural sector due to market and climate failures makes young people believe the sector cannot give them the decent employment they desire, hence, they perceived agriculture to be unattractive and not a respected sector for educated youth to venture into.

This has further been compounded by difficulty in accessing the productive resources young people need to start an agricultural venture or business. Particularly, access to land is a limiting factor to young people's involvement in agriculture. Trade policies that include importation of chicken and other agricultural products into Ghana was also found to be a negative influence on young people's involvement in agriculture

Anyidoho et al. (2012) observed that young people in Ghana are dis-incentivised in taking up agriculture and its related activities due to the perception of the high risks associated with agricultural activities coupled with low income.

Kadzamira and Kazembe (2015) conducted a study to assess how the youth of Malawi were engaged in agricultural policy formulation of the country, they found that youth attitude toward agriculture was negative. Malawian youth perceived agriculture or farming to belong to people who

have no alternative enterprises to pursue and not also a business but rather a way rural people live their live. For this reason, the youth hope to leave the agriculture sector when they get other opportunities or save enough money to start a different business.

Shayo (2020) in a study, conducted a stepwise linear regression analysis to identify the predictors of a youth choice of a carrier in agriculture and found that gender and age have no influence but subjective norms, attitudes and perceived behaviour control, rather had an influence on the choice of a youth carrier in agriculture in Tanzania.

Additionally, the study found that youth who had experiences in agriculture by way of having their parents farming had a higher chance of choosing a carrier in agriculture than those who did not. Knowledge in agriculture, particularly through education also influenced youth in choosing a carrier in agriculture. In addition to this, capital availability was also one of the critical incentives that shaped the choice of youth to venture into agriculture and entrepreneurship. The study also found that the youth that participated in the study only understood agriculture to mean only farming hence the difficulty in choosing a carrier in the agriculture sector (Shayo, 2020).

Metelerkamp et al. (2019) in a study to unravel the paradox of young people refusing to take up employment in South Africa's agricultural sector despite high level of youth unemployment in the country. Used SenseMaker® (a tool or software for collecting ethnographic data) to collect narrations shared by respondents aged between 16 to 35 years and rendering these significant, thereby producing both qualitative and quantitative data.

Individual youth perception toward agriculture was used for the creation of a picture of social values akin to that pertain to youth nationally. The results showed that 206 (36%) out of 573 of the narratives/perceptions were positive toward agriculture. The 36% was made of 26% youth who view agriculture as an exciting carrier path while 10% saw work in the agriculture sector as a stepping stone.

The negative perception totalled 64%, out of which 21% of the youth viewed work in agriculture as a means of survival. These negative perceptions contain themes including agriculture being a dirty job, meant for elderly people and for poor people. Similarly, agriculture was perceived to require very hard work but yield very little financial reward coupled with very high risk for those who choose it as a carrier path (Metelerkamp et al., 2019).

On what motivated the narratives or perception of the youth toward agriculture, they were asked to select from the following perspectives; personal, community and environmental. The personal perspective was chosen by 90% of respondents who said their perception about agriculture was based on their quest to make a good living, only 5% choose environmental concerns. On carrier aspiration in agriculture 20% wanted to start their own business, 12% wanted a stable employment in the sector whiles 8% were hoping to come across an income generating venture in the sector. It was also found that making carrier decision in agriculture was difficult compared to other fields, 29% of the respondents felt strong about that whiles 61% of respondents also associated themselves with that (Metelerkamp et al., 2019).

Determinants of Youth Engagement in the Broiler Value Chain- An Empirical Review

The population of Ghana can, be described as youthful having recorded 34.2 percent of the population aged between 15 and 35 years old (Ghana Statistical Service, 2012). The high number of young people in any population has positive and negative consequences. A ‘‘demographic phenomenon known as the youth bulge’’ (Ortiz & Cummins, 2012, p. 4). The positive potential of youth bulge can be tapped for a nation when the high youthful population is gainfully employed. It lowers the dependency ratio while increasing per capita income of the people (Lin, 2012). On the contrary, large numbers of unemployed youth can bring insecurity to nations, lower economic growth, and waste their talents (Agbor et al., 2012).

According to, Brooks et al. (2013) the agricultural sector was specially placed to employ Africa’s youth, particularly as it is a sector familiar to most youth especially those from rural areas adding that the key to this approach was for policy makers to view the sector as holding the key to employment creation for the youth.

In one of the earliest empirical publish research, on this subject in Ghana, Sumberg et al. (2012) acknowledged the problem of young people and their involvement in agriculture and how policy response was not supported by evidence, history, and theory in a context that is sensitive, using the phrase ‘opportunity space’ to denote “the spatial and temporal distribution of the universe of more or less viable options that a young person may exploit as she/he attempts to establish an independent life” (p. 5).

Sumberg et al. (2012) explained that the "opportunity space" is subject to "global, national and regional factors including institutions, policy and demand" and may be divers in rural areas, to exploit this opportunity space by a young person it is contingent on their ability to access the relevant resources, have the right knowledge or skills and attitudes among others. To make young people explore the agriculture sector in the context of "opportunity space" require the shaping of agriculture beyond primary production to entail production, marketing, retailing and exporting. This would offer young people the opportunity to take-up roles such as producers, employees, employers and consumers.

Further, Sumberg et al. (2012) agreed with Anyidoho et al. (2012) that the interest, willingness, and ability of young people to be involved in agriculture is variedly driven by relations and social factors such as cultural, capital, gender, age and class as well as media exposure and formal education. Adding that some of these deriving factors determines access to key resources including labour and land.

Sumberg et al. (2017) in an attempt to understand the growing, believe among development professionals and policy makers in Africa that agriculture was critical in solving the problem of youth unemployment in the continent. Seek, answers to the following questions (i) "What explains young people's attitude toward farming?" (ii) "What should be done about young people and farming?" (p. 153). Through a study that involved 38 Senior High School students in Ghana (Tepa Senior High School and Savelugu Senior High School) aged between 15 and 23 years old with 18 students being males used

Q Methodology to undertake the study. This method does not require a representative sampling or large sample size.

The results showed that, study participants perspective on the research question (i) which basically focused on the factors that drive young people away from farming and agricultural-related work included; education, location, availability of services (e.g. electricity, schools, options for employment) in rural areas and farming lacking modernity (or dirty work), parental influence, lack of respect for farmers, farmers work hard for little reward and farmers are poor (Sumberg et al., 2017).

Whereas question (ii) was focused on identifying what need to be done in order to attract young people to agriculture, the following were the perspectives of the respondents; creation of public awareness that increase respect for farmers, modernise and introduce technology and mechanisation into farming, provision of services in rural areas, training (eg.in understanding market-based opportunities), and increasing the awareness of young people to the opportunities in farming, an attitude that approach farming as a business, increase but easy access to land and credit (Sumberg et al., 2017).

The various perspectives from study participants suggest a negative attitude toward farming, which may be attributable to different perceptions and understandings. In conclusion, to help young people give their attention to farming or agriculture. The factors affecting agricultural productivity should be jointly addressed with policy and development interventions that would enable young people to be engaged in farming or related activities (Sumberg et al., 2017).

In a study by Mabe et al. (2020) which focused principally on a Solidaridad led project called Next Generation Youth in Cocoa Programme (MASO) that seeks to encourage youth to take up cocoa farming, implemented in Central, Western, Ashanti, Brong Ahafo and Volta regions. Found that, more males were involved in cocoa farming activities than any other activity along the cocoa value chain. Whiles nursing and selling cocoa seedlings was the activity engaged in by most of the MASO youth. Also, some of the youth, 52% (cocoa farming), 37% (supply labour services for farm maintenance), 40% (production and selling of cocoa seedlings), and 36% (sale of agrochemicals) were engaged in the above cocoa value chain activities. These youth also had their parents involved in cocoa farming. This suggest that parents pass on their farmlands and cocoa farms to their children (Mabe et al., 2020).

The youth who were involved in cocoa farming and cocoa labour supply were found to be a bit older than those that were not engaged in these activities. It was also found that, there was a mutual interdependence relationship among the various cocoa production activities when the multivariate probit (MVP) estimation was done through pairwise correlation matrix (Mabe et al., 2020).

In identifying what determines the choice of a youth for a particular cocoa value chain activity, it was found that age was one of the demographics that influence the kind of cocoa value chain activity they decide to provide their labour. Particularly, age significantly influenced youth participation in cocoa farming, selling of cocoa seedlings, and cocoa labour supply and

production. The chances of participation of a youth in the above activities increases as their age increase (Mabe et al., 2020).

Additionally, Mabe et al. (2020) also found that sex (male or female), level of education, household size, the occupation of parents, access to land, access to training, access to credit, and participation in a government or NGO project/programme all have both positive and significant influence on youth choosing to participate in either one or more (cocoa farming, production and selling of cocoa seedlings, supply of labour services for cocoa farm maintenance and selling of agrochemicals) of the cocoa value chain activities. Previous experience (ever worked in a cocoa farm) and perceptions about cocoa farming (decent job, profit) were, however, activities that drive the youth away from cocoa value chain. The study concluded that there were both complementarity and substitutability in the four cocoa value chain activities considered. Suggesting that a youth may be involved in more than one of them.

In a study conducted in the Catalonia region of Spain by Góngora, et al. (2019) it was observed that young people were open to change and are easy to adjust to new things, coupled with their high energy levels which could benefit the livestock sector. However, their low level of involvement in the livestock industry was worrying. Across Europe the average age of farmers under 35 years was 6% and 3.7% for Spain. Specifically, to the livestock sector the average is 5.7% across Europe and 2.9% for Spain. The study, therefore, was aimed at analysing the possible ways young farmers can be incorporated into Spain's (Catalonia) livestock sector.

Using the Q-Methodology, through an analysis of discourse characterised young livestock farmer's experiences in joining the livestock sector. Semi-structured interviews were conducted for 24 respondents drawn from the livestock sector, generating 219 statements. Five (5) pathways were identified, through which young people can be included successfully in livestock work; (i) the Traditional pathway; (ii) the Neo-rural pathway; (iii) the Business pathway; (iv) the Industrial pathway; and (v) the Agroecological pathway. However, for a young person to choose any of the five pathways to join the livestock sector as a worker or entrepreneur, the main drivers that determine that were identified as (i) the presence or absence of an agrarian family tradition (ii) the capacity to access adequate land; (iii) the education level;(iv) the degree of innovation in livestock activities; (v) the degree of autonomy in decision-making. Concluding, two major challenges that require the attention of policy makers were identified as the facilitation of land access and the development of training services (Góngora, et al., 2019).

In analysing "young people's willingness to farm" a total of 86 young people (47female and 37males) between the ages 17 and 24 years were interviewed using structured questionnaire, the selection criteria did not include involvement in farming or otherwise. The results showed a number of factors that drive "young people's willingness to farm" or not to farm. These include, the high risks involved in farming (e.g. "pests and diseases, fluctuating prices for agricultural products, drought and floods"), low profitability, the need for capital and the difficulty of accessing land, parent farming systems, government support, knowledge of farming practices and marketing (Salvago et al., 2019, p. 285).

The study concluded that it was more beneficial to jointly study both "young people's plans in the prevailing conditions, and their hopes and their preferences should conditions change when conducting studies of young people's willingness to farm", than just one in a given studies (Salvago et al., 2019, p. 288).

Choosing Broiler Value Chain Business as a Vocation-Empirical Involvement of Youth in Africa

Scholars have identified four kinds of employment from the social work perspective: protective, preventative, promotive, and transformative. They argue that the ideal employment for the youth should either be promotive or transformative. The latter two provide the opportunity for income enhancement, capital accumulation, and ensures equity as well as social inclusion (Sumberg & Okali, 2013). To this end, Goris (2016) asserted that the agricultural sector is in the position to offer employment to young people, stressing that food and raw material demand keep increasing and more labour is required for production to meet the demand.

This holds true for a country like Ghana, where historically, agriculture has been the major source of employment. Over the decades, however, the sector keeps declining in its share of employment and contribution to gross domestic product (GDP). The period between 1984-2000 employment rate in the agriculture sector reduced by 8 percent, this notwithstanding in 1991 and 1992 for every 10 Ghanaian workers, 6 were employed in the agricultural sector. However, in 2012/2013 agriculture accounted for 52 percent of employment. The importance of agricultural production activities, in

employment creation cannot be over-emphasised (Ministry of Employment and Labour Relations, 2014).

However, the involvement of the youth in the sector has been tried and tested in programmes such as the Youth-in-Agriculture Programme (YiAP) of MoFA. YiAP was launched in 2009 and had the "block farm program" as its major component (Food and Agriculture Organization, 2015b). It was to develop youth as entrepreneurs in agribusiness. Contrary to its objective, YiAP recorded very low youth enrolment in the programme compared to adults and the elderly. Among the total number of farmers who participated, only 25 percent were youth (Goris, 2016).

It has been argued that the youth have an entry niche to some agricultural value chains either as assemblers, traders, apprentices, and porters where they can build capital and transition with time to other areas of the chain (Haggblade et al., 2012). However, for the broiler value chain, it is far easier to be involved and possibly start a business than horticulture and dairy value chains, because of the low initial capital required to start. Whiles the unstructured nature of the broiler value chain in many African countries also allows entry by various players (Mulema et al., 2021). However, an earlier study by Góngoraa et al. (2019) contends that it was rather easy for the youth to start a business enterprise in crops than in the livestock sector.

This, notwithstanding, there are a number of factors that influence choices made by the youth in their involvement in agricultural value chains. Some of these factors may be due to established barriers. One of the earlier studies on this subject which looked at the declining involvement of Nigeria's rural youth in agriculture identified three factors limiting the involvement of

youth in agriculture. These are environmental, economic, and social factors (Akpan, 2010).

According to Akpan (2010) the environmental factors are scarcity of land for farming, depletion of soil fertility, and decreasing farm yield. Whiles the economic factors include inadequate credit and insurance, low profitability, and lack of start-up capital and inputs. Accordingly, the social factors were parental influence and the perception the public has about farming. The economic factors were, however, ranked the highest or the most critical factor pushing youth away from agriculture.

In a related study, Umeh et al. (2020) evaluated the socio-economic factors that influence the choice of youth in Ebonyi State, Nigeria to choose a given agricultural value chain business**.** The study's findings showed that many of the youth agripreneurs were involved in either agricultural production or marketing and distribution. And their choice to undertake and invest in a given agribusiness was influenced positively by age, gender, marital status, household size, and educational status. The rests were annual income and sources of investment capital.

Specifically, it was found that more males choose agripreneurship than females as gender was found to be positive and significant at 1%. Similarly, age was also positive and significant at 1% indicating a tendency for more youth who are increasing in age to venture into agripreneurship. Also, the educational qualification of respondents was found to be positive and significantly influencing agripreneurship engagement of the youth. Whereas family agripreneurship history was found to be positive and significant at 5%, this means youth whose parents were already in agripreneurship are more

likely to choose it. However, primary occupation was found to negatively affect the choice of youth to undertake and invest in a given agribusiness (Umeh et al., 2020).

Similarly, in a study that assessed factors that influenced the involvement of youth in Abia State, Nigeria in poultry production, Nmeregini et al. (2020) found that Abia state youth were involved in the following activities along the poultry production chain, feeding, packing and replacement of litter, vaccination/medication, brooding, marketing and hatchery operations, and transportation of poultry products.

The results from regression analysis showed that age had a positive co-efficient and was significant at 5%, this shows youth involvement in poultry production increases with age. It was also found that the years of experience in poultry production was also positive and significant at 5%, with this, youth who have more years working in poultry production have an increased chance of being involved in poultry production than those who did not. Also, membership of cooperative and extension contact were all found to be positive and significant at 5% (Nmeregini et al., 2020).

Yussuf et al. (2021) studied the determinants of youth participation in agribusiness in Oluyole, Oyo state Nigeria. The results from a logit regression showed that age influenced youth participation in agribusiness positively and was significant at 1%. Similarly, knowledge of agribusiness was also found to be positive and significant at 5%.

Tarekegn et al. (2022) assessed the factors that constrained the participation of youth in agribusinesses in the south of Ethiopia. The study focused on identifying the enterprises youth participate in, the challenges and

what determines their participation. The results showed that 10.63% of respondents were females and 89.38% were males implying that males were more inclined to take responsibility in agribusinesses than females. Only 14% of respondents attained diploma, the rest were all under the high school grade, also implying that youth with higher education turned to search for different jobs than engaging in an agricultural enterprise. Majority of the youth studied were involved in livestock enterprises (63.3%) with the remainder (37%) into crop related enterprises. The livestock enterprises include poultry, large and small ruminants.

Also, the availability of land for agribusiness, bureaucracy associated with accessing credit, fear of being in group, lack of initial capital and education level of youths were all significant at 1% but showed a negative sign from the regression analysis implying that these factors were adversely affecting the participation of youth in agricultural enterprises (Tarekegn et al., 2022).

Ng'atigwa et al. (2020) studied the influencing factors of youth involvement in horticulture agribusiness in the Njombe Region of Tanzania. The results showed that more males (59.6%) compared to females were involved in the horticultural business, probably due to the time consuming and labour-intensive nature of the sector. Also, credit access by males was high (41%) compared to females (36%). Among the respondents 63.5% had primary education, which explains the high rate of adoption of innovations in post-harvest management. At the same time, 74% of respondents also had experience in farming, demonstrating the importance of farming experience as a determinant of youth participation in horticultural agribusiness.

Additionally, results from the ordered logit model showed that primary education, management innovation, access to credit, perception of horticulture as a good business, and improved packaging materials were all both positive and significantly influenced the involvement of youth in horticulture agribusiness. However, gender female and land size were both negative and significant implying that female youth are less likely to choose horticulture agribusiness as a vocation while an increase in land size requirement for production discouraged the involvement of the youth in horticulture agribusiness (Ng'atigwa et al., 2020).

A study conducted jointly in Zambia (Southern Africa) and Vietnam (Southeast Asia) by Mulema et al. (2021) examined the participation of youth in agriculture, and agribusiness, and what influences their perception toward agriculture, as well as the factors impacting youth participation in agriculture. Results from the study showed that in Vietnam, 67% of the youth were into agribusiness as their main source of livelihood whiles in Zambia 69% of the youth were involved. However, off-farm work was ranked second in both Vietnam and Zambia with more females participating in off-farm labour in the two countries. It was also found that in Vietnam more females than males were salary employees.

The dominant agribusiness most respondents were involved in was crop production, 99% in Zambia and 88% in Vietnam. It was also found that some of the youth were engaged in animal production because of the availability of the market, high returns on investment, and high productivity. In Zambia majority (54%) of the youth were into poultry enterprises whiles in Vietnam, it was pig production (Mulema et al., 2021). There are similarities in

the findings on females in Vietnam and Ghana, as reported by Mwaura et al. (2015) who found Ghanaian youth to be more interested in salaried jobs than doing their own businesses in the agriculture sector.

On the perception of the youth regarding the agricultural sector, respondents in Zambia recorded a mean score of 1.95, representing a positive perception of the agricultural sector. Respondents believe the sector is not for old people and that it can provide them with livelihood opportunities. Females were more positive than males (1.87 for females and 2.00 for males). This also implies that it is not true that educated youth or youth, in general, do not want to engage in agriculture whereas in Vietnam the mean score was 2.86 (2.84 for females and 2.87 for males), indicating a negative perception of the youth toward agriculture (Mulema et al., 2021). These findings in Zambia are similar to what has been reported by Bosompem et al. (2017), who found about 67% of the 165 University of Cape Coast agribusiness students studied ready to be involved in agriculture as a vocation after their university education.

The factors that motivate or demotivate youth to take up agriculture were identified by the youth in Vietnam as land availability (83%), having knowledge and skills in agriculture (57%), the contribution of agriculture to household livelihood improvement (48%). For respondents in Zambia, having agricultural skills (51%), and access to credit (50%) are the key motivating factors (Mulema et al., 2021).

On how perception and socioeconomic factors affect the participation of the youth in agribusiness, it was found that as people grow older, they are more likely to engage in agriculture. The same as having access to extension advice, the availability of extension advice motivated people to engage in

agriculture. Respondents located or living in urban areas of Zambia were more likely not to engage in agriculture. This was contrary to the situation in Vietnam, where they were found to engage in agriculture probably because of their focus on marketing and input-related activities. Individual perception was also found to be statistically significant and negative toward youth participation in agriculture in Vietnam but not in Zambia. However, in both Zambia and Vietnam membership of a youth group or farmer group had a positive effect on the participation of youth in agriculture (Mulema et al., 2021).

Magagula and Tsvakira (2020) conducted a study in Nkomazi municipality of South Africa that focused on how the perception of youth directs their individual entrepreneurial decisions. The study population was stratified, and 120 youths were selected and interviewed with a structured interview questionnaire.

The results showed that 62% of respondents were females, and 89% had secondary education that included a course in agriculture. The respondents were found to have a mixed (both negative and positive) perception regarding the agricultural sector. The mean score of 1.36 was recorded for economic perception, implying that there are opportunities in the agricultural sector that would allow them to achieve their individual economic goals. However, a mean score of 1.78 for individual perception was recorded demonstrating respondents did not believe that their personal abilities, qualities, and ambitions are suitable for the agricultural sector (Magagula & Tsvakirai, 2020).

On the socio-cultural indicators, the mean score was 2.01 demonstrating the youth perceive an alignment between activities of the agricultural sector and their social values. Hence, demonstrating a unanimous agreement of the similarity between their social values and agricultural activities (Magagula & Tsvakirai, 2020). This study agrees with earlier findings by Mwaura et al. (2015) who found that youth in Ghana believe the agricultural sector has opportunities that can offer them sustainable employment.

Additionally, binary logistic regression analysis was conducted, and the results show that the respondent's marital status was negative and significantly influenced youth's intention to participate in agripreneurship ($P < 0.05$), implying married individuals would not participate in agripreneurship. However, the level of financial support from parents was statistically significant and influences the intention of a youth in participating in agripreneurship ($P < 0.01$), this result shows that a youth that is provided with 50% of the initial capital by parents would participate in agripreneurship (Magagula & Tsvakirai, 2020).

There was also statistical significance ($P < 0.01$) for the variable agricultural studies, youth who studied agriculture either in secondary school or tertiary are influenced positively to have the intention to participate in agripreneurship than those who did not. The perceptions of the youth were also found to be statistically significant ($P < 0.05$) and influenced youths' intention to participate in agripreneurship. This result signifies that a youth who has a positive economic perception of the agricultural sector would participate in agripreneurship (Magagula & Tsvakirai, 2020). This finding

agrees with Bosompem et al. (2017) and Mulema et al. (2021) on how studies in agriculture positively influence the willingness of the youth to be involved in Agriculture.

Job Creation Potential of the Broiler Value Chain in Africa

Agriculture has been the source of economic development and poverty reduction in many countries, providing an effective means to reduce poverty (Cervantes-godoy & Dewbre, 2010; Diao et al., 2010). It has been described as a "precursor" for industrialization which leads to the transformation of economies and reduces poverty (Byerlee et al., 2009:16).

This has been made possible in most cases through agricultural value chains. Value chains can provide the opportunity for decent work through increased and secured income for men and women. It also symbolises the organisation of the private sectors' ability to spread economic gains among all (Hakemulder et al 2015). There is an enormous job-creation opportunities within value chains, which can be identified through mapping of the value chains and conducting surveys to ascertain the job opportunities within a given value chain (Farole et al., 2018).

Within the livestock sector of agriculture, commercial poultry (broilers and layers) value chains have been identified as sectors with high impact "job-creating potential" (Krishnan & Peterburns, 2017). Well managed value chains increase their profit share and competitiveness (Piboonrungroj et al., 2017). Which brings about economic growth and industrialization in nations with accompanying benefits such as job creation in the sector (Ncube, 2018).

Van Horne (2018) estimated the employment creation potential of the 28 member EU countries' broiler value chains. For every 1,000 tonnes of

broiler meat produced, the broiler value chain created employment for 4.4 people at the production level (primary production) and 0.7 for hatchery operators, 1.5 for operators in the feed sector and 2.1 for the support service sector. Whiles 14.4 employment or jobs are created for those in the slaughterhouses/processing. This resulted in 23.1 full time employment for every 1,000 tonnes of broiler meat produced.

In the case of the United States of America, the broiler industry created 1,195,745 jobs while the egg industry generated 81,515 jobs in the year 2016 (National Chicken Council, 2016). Van Horne (2018) reported that in the year 2017 poultry value chain businesses in the 28- EU member states created up to 367,554 jobs. Out of which 300,000 was attributed to the broiler industry.

Whiles Brazils' poultry industry created 5 million jobs with 3.5 million being direct and 1.5 million being indirect jobs. This constitutes nearly 5% of the number of people that are formally employed in the country (Brazilian Poultry Association, 2012; Ćompos, 2016).

One of the known leading poultry producers in Africa, that is South Africa, through the poultry value chain generated a total of 111, 822 jobs at the end of 2018. Out of this 49,887 people were directly employed in the broiler value chain, 7,642 in the layer value chain and 18,817 were employed in related crops sector (white and yellow maize, and soybean). The additional indirect jobs created as a result was 61,935 (South African Poultry Association, 2018).

It is, however, difficult to quantify the current number of jobs created by the poultry sector in Ghana due to the paucity of data (Andam et al., 2017; Sumberg et al., 2013). This notwithstanding, Aning et al. (2008) estimated the

number of people employed in both broiler and layer production sectors to be 7000. The authors fail to specify if the jobs estimated were from the broiler value chain or layer value chain. They did not also state if the jobs were full-time or part-time jobs neither did, they say if they were direct or indirect jobs created by the sector.

The types of jobs or businesses that youth can be involved in the broiler value chain include the production of broiler chicken, distribution of feed, transportation of birds to the market, value addition (smoking chicken for preservation), production of feed and offering vaccination services (Mulema et al., 2021).

Theoretical and Conceptual Framework

Theoretical Framework

The main theories underpinning study are the innovation theory of profit and the theory of utility maximization. The ensuing sections presents a discussion on the theories.

Innovation Theory of Profit

The innovation theory of profit by Joseph Schumpeter posits that the main function of an entrepreneur is to introduce innovations and the profit in the form of reward is given for his or her performance. Innovation in this context refers to the measures, strategies, or policies embarked upon by the entrepreneur to reduce production costs or increase the demand for the product (Schumpeter, 2017). In the field of economics, this 'Schumpeterian theory" remains the most insightful that provides a framework that is comprehensive for the understanding of innovation and entrepreneurship (Callegari & Nybakk, 2022).

Innovation can, therefore, be viewed from two perspectives; the first is measures, strategies, or policies aimed at reducing the overall production cost (product innovation) such as introducing the use of machinery and equipment, the introduction of a new technique, or realignment/organising the business along a productive model such as the value chain approach. The second perspective to innovation is on initiating activities to make the demand for the product increase (market innovation) by opening or finding new markets for the products, coming up with new designs or products that consumers want as well as sourcing raw materials from new suppliers (Schumpeter, 2017). The main characteristics of innovation are novelty and invention which always results in profit and efficiency (Menna & Walsh, 2021).

Since, a typical entrepreneur seeks profit to benefit themselves and their family (Gimeno et al., 1997). Their ability to successfully undertake an innovation to reduce the overall production cost or find markets for the product to increase its demand gains profit. These profits, however, are short-lived as competitors in the market begin to imitate the innovation. As competitors imitate the innovation, the entrepreneur loses the monopoly enjoyed over it. For the entrepreneur to continue to enjoy the monopoly and ensure profits do not fall Schumpeter argued that the innovation must be patented (Schumpeter, 2017).

Business firms whether family own, or nonfamily businesses are risk takers, although the level of risk is proportional to the profit (González et al., 2021). In this context, the innovation theory of profit intimates that the entrepreneur is not the one who bears the risk for the business but the provider of capital for the business (Schumpeter, 2017). These critics argue is not so,

but rather the entrepreneur is the risk taker in any business, not the 'capitalist'. Additionally, innovation theory also failed to consider the element of uncertainty as a critical factor that gives rise to profit. Critics opined that it is far more important than innovation, if entrepreneurs can predict with certainty future demand and supply requirements of their products, they would still make a profit without innovation. There are also other means an entrepreneur can make a profit aside from innovation such as through monopoly or chance profit. Innovation is not the only role that an entrepreneur plays in a business (Knight, 2019).

The major broiler value chain actors, who are acting as entrepreneurs at various stages of the broiler value chain position themselves to make decisions aimed at taking up innovations to be rewarded with profits. Hence, the use of Schumpeter's innovation theory of profit, to guide the study in estimating the gross profit, profit share and profit efficiency levels of actors on the broiler value chain.

These actors aimed to make profit by introducing various innovations such as new technology for production while broadening their market access to inputs and products. Additionally, the study also identified the factors influencing the ability of the domestic broiler value chain to generate employment, particularly for the youth. Earlier studies by Agiomirgianakis et al. (2006) reported that the net profit growth in Greece's manufacturing businesses increased their net growth in employment among Greek manufacturing industry. This buttressed the relevance of the innovation theory of profit to this study.

Theory of Utility Maximization

Individuals take into consideration the context and personal factors in decision-making (Magnusson & Törestad, 1993). As such, given a fixed utility function will choose the best alternative. As individuals or consumers are typically utility minimizers. This constitutes the utility maximization theory. The theory of utility maximization states that consumers or individuals seek to maximise their utility (worth, usefulness) or satisfaction from the choices they make. This theory has been used widely in social science to explain how people make choices (Aleskerov et al., 2007).

The theory of utility maximization assumes that consumers or individuals behave rationally when faced with two choices and would make a choice that gives them the maximum utility. In furtherance to this, consumers or individuals are also assumed to know their environment or the products available, they have an organised preference system that is stable, have skills to compute the choices or courses of action available to see which one would give the highest attainable preference or utility (Simon, 1955). The theory also helps to explain human behaviour in the choices individuals make in employment, either to seek employment from existing organisations or to create employment for themselves as entrepreneurs (Douglas & Shepherd, 2002).

The assumptions underlining utility maximization theory have drawn criticism on the grounds that, consumers or individuals are not always rational as some make impulsive decisions. There is also the issue of the loyalty effect which causes some consumers or individuals to stick to brands that would not give them the maximum utility when compared with available alternatives.

Additionally, given the share number of products or share number of items to choose from, individuals sometimes are unable to make all the necessary comparisons to arrive at the choice among the lot that gives maximum utility. This may be due to a lack of knowledge or the right skills (Simon, 1955).

The relevance of this theory to the studies is enormous as it provided guidance to the identification of the drivers of youth engagement or employment in the broiler value chain and their choice of broiler value chain activity to undertake after graduation. This theory reiterates the role played by the environment in influencing the choices individuals make, it holds true from the findings of Laughland-Booÿ et al. (2015) that Australia's young people's choice of vocation after school was influenced by their material condition and the social resources available to them. In line with this, the study examined the influence of perceived knowledge, resource availability, economic, government policy and socio-cultural issues as well as youth socio-demographic characteristics (e.g. age, sex, place of residence, parents occupation, engagement in an economic activity, etc.,) on the choice of vocation after graduation of final year undergraduate students offering agriculture programmes. Since the utility maximization model on the decision-making of human beings posit that individuals select a course of action that gives them maximum satisfaction (Douglas & Shepherd, 2002).

In the area of carrier or employment an individual would choose the one that guarantees greater utility. The maximum utility or satisfaction can be the income to be gained, working conditions and the anticipated risk, work effort as well as independence (Douglas & Shepherd, 1999).

Conceptual Framework

The conceptual framework for the study is shown in Figure 1. It is based on the innovation theory of profit and the theory of utility maximization.

The domestic broiler value chain performance and ability to generate employment, particularly for the youth is influenced by the profitability and efficiency of businesses along the chain as the owners of these businesses introduce various innovations in order to be rewarded with profit. However, profitability and efficiency are impacted positively or adversely by institutional factors such as government policy or the state of the national economy. It can also be influenced by the socio-economic characteristics of the broiler value chain actors. These may include the level of technology adoption and usage, ability to access credit and risk mitigation policies. Additionally, the sex, age, educational level of the actor as well as their household size all have an influence on the profitability of their businesses. Similarly, challenges such as the high cost of production inputs or the inability to market products would also affect profitability. All these factors as posited by "Schumpeterian theory" would adversely or positively impact on the innovation the entrepreneur's (business owner's) has introduced to either lower the cost of production in his or her broiler value chain business or increased the demand for products.

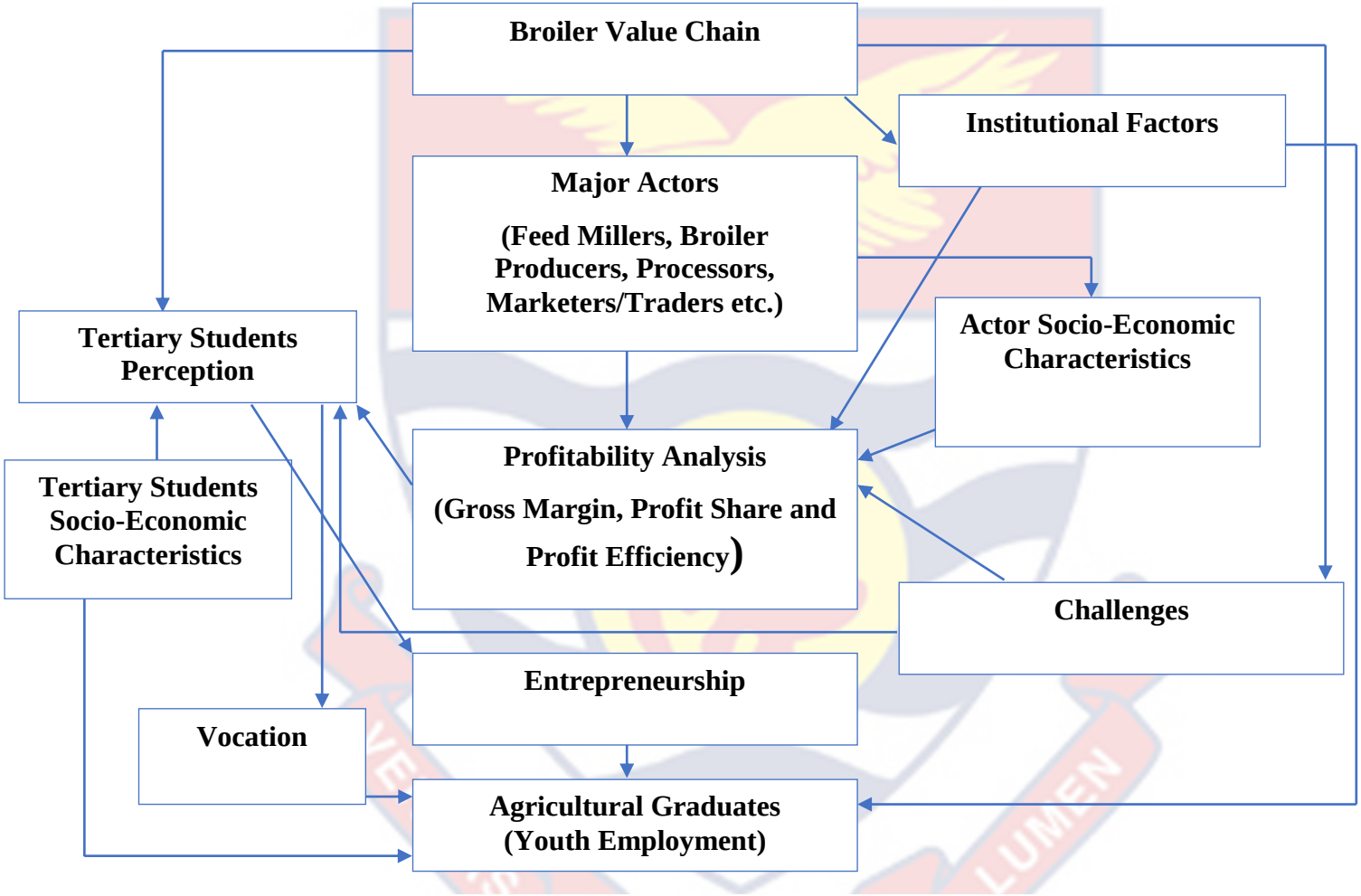

Figure 1: Conceptual Framework of Performance and Challenges of the Domestic Broiler Value Chain and Implications for Employment Generation in Ghana. Source: Author's construct (2022)

The domestic broiler value chain profitability, existing challenges, students' socio-economic characteristics influences the perception of the students. Some of the socio-economic characteristics of the students are age, sex, parents' occupation, place of residence whether rural or urban and family background as in household size, involvement in an economic activity among others. The type of perception the students develop toward broiler value chain activities influences them in choosing broiler value chain as a vocation or becoming entrepreneurs in the sector as they seek to maximise their utility in the area of employment. Youth employment is therefore influenced by institutional factors, choice of vocation and entrepreneurship.

Chapter Summary

This chapter reviewed literature from scientific journals, books, reports from government agencies, and international bodies as well as conference papers and web-based publications. This included a review of various commercial poultry production systems in Ghana, the broiler value chain and its relevant actors and product pathways. Literature on the challenges, and cost drivers, competitiveness of the domestic broiler value chain was also reviewed. Additionally, how these impact on the profitability of the actors on the chain, their gross profit and profit efficiency levels as well as the job creation potential of the local broiler value chain were all reviewed.

A review of relevant literature regarding the engagement of youth in agribusiness with focus on the domestic broiler value chain as a vocation was also done. It was targeted at understanding how perceived knowledge level in broiler value chain activities and the perception of the youth influence or drive their willingness to engage in broiler value chain or agribusiness. This

culminated in the identification of relevant theories and subsequent development of a theoretical and conceptual framework for the study.

CHAPTER THREE

RESEARCH METHODOLOGY

Introduction

The purpose of this study was to analyse the current performance and challenges of the domestic broiler value chain and its implication for agricultural graduate employment in Ghana. This chapter describes the techniques and methods used to conduct the research. The areas covered comprised the research design, study area, study population, sampling procedure and sample size. The rest were data collection instruments, pilot study, data collection procedure, and data processing and analysis.

Research Design

The research was designed as a mixed method of the concurrent nested strategy model. This research approach allowed for the use of both quantitative and qualitative methods to collect data for the study (Creswell et al., 2003). However, the quantitative method was predominant over the qualitative method which was embedded or nested. This helped in providing a complete understanding of the research problem (Hanson et al., 2005). At the same time, the qualitative data complemented or addressed the aspects of the study that the quantitative data was not able to address (Creswell, 2014).

The quantitative method enabled the study to examine the relationship between the variables of interest (Creswell, 2014). Although, the qualitative method is less concern with causality and numbers when compared to quantitative method, it however, focuses on words norms, values and meanings (Neuman, 2014). Given the nature of the research problem, which focuses on the performance and challenges of the broiler value chain, its'

potential to generate employment for agricultural graduates and the drivers of their engagement on the activities of the broiler value chain as employees or entrepreneurs. It was necessary to use both quantitative and qualitative methods to collect the data alongside reports and documents from government agencies and other institutions for analysis with the requisite statistical test and triangulation (Bordens & Abbott, 2014). Hence, the choice of mixed method over quantitative or qualitative research method alone.

As the case has been, studies such as this is underpinned by philosophical leaning. Accordingly, the pragmatic paradigm or world view has been used in this study. The pragmatic world view allows for the combination of post positivist and constructivist world views (post positivists hold the belief that knowledge is absolute and that causes are the determinants of outcomes, whereas constructivist hold the view that individuals seek understanding of the world in which they live and work) in a manner that provide an understanding of the problem being studied (Creswell, 2014; Neuman, 2014). This ensures that the research produces evidence that is precise, rigorous, relocatable, and generalizable for the objectives of this study that are being measured by the quantitative research method. While those objectives measured using the qualitative research method it gives broader insight on the domestic broiler value chain and its actors (Creswell, 2014; Hanson et al., 2005; Neuman, 2014).

Further, the cross-sectional descriptive survey design was used. Cross-sectional designs allow data on a given population to be collected at one point in time to ascertain the relationship between variables of interest and the extent of their frequency of occurrence in the population. The data used for

this study was collected once, hence the use of cross-sectional design over longitudinal design. Longitudinal research designs require multiple data collection at different times on the same population. As such can provide a moving picture of the variables being studied. But it requires more time and is costly compared to a cross-sectional descriptive survey that costs less but cannot measure change, it only provides a "snapshot" of the life of the population (Neuman, 2014).

Study Area

The research was conducted in four (4) out of the sixteen (16) administrative regions of Ghana (see Figure 2). The broiler value chain aspect of the study included the Greater Accra, Ashanti, and Bono Regions. While the student aspect was undertaking in Central, Ashanti, and Bono Regions. Two of these regions, Greater Accra and Central region are in the coastal belt and the Central region shares its eastern border with the Greater Accra region, while the Ashanti and Bono regions (formerly part of the Brong-Ahafo Region) are in the middle belt of Ghana respectively. These regions are generally populated. Of the 30,832,019 national population, Greater Accra recorded 17.7%, Ashanti 17.3%, Central 9.3%, and 3.9% for Bono (Ghana Statistical Service, 2021).

Greater Accra and the Central region have mixed economic activities including fishing, trading, and agriculture amongst others. The Greater Accra region has a total land area of 3245 km^2 and host the highest number of large commercial poultry feed mills in the country. The Central region, on the other hand, has about 9,908 km^2 of total land area out of which 7,864 km^2 is considered arable land.

The Ashanti region has a total land area of 24,869km^2, agriculture is one of the major economic activities in the Ashanti region. It has 1,463,340 hectares of arable land out of which a total of 1,181,788 hectares are being used for agricultural purposes. Similarly, the Bono region has a total land area of 11,481km^2 and an agro-based economy serving as a major food-producing region in Ghana. The Dormaa enclave in the Bono region is noted as a major poultry producing hub in Ghana (Mensah-Bonsu et al., 2019). As the area shares border with Côte d'Ivoire to the north which allows inflows of cheaper maize and day-old chicks for poultry businesses (Yevu & Onumah, 2021).

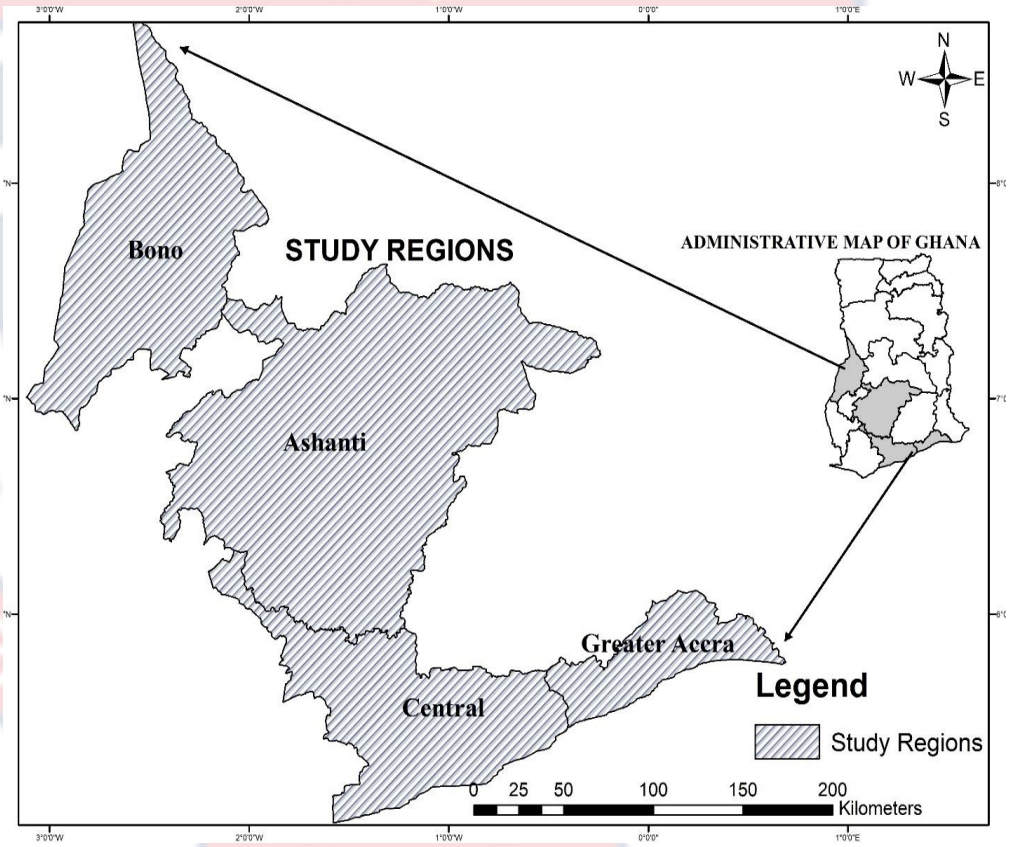

Figure 2: A map of the study area: Greater Accra, Central, Ashanti and Bono Regions. Source: Author's construct (2022).

In the area of poultry production, there are 1,508 commercial broiler farms in Ghana. Most of these farms are in the Greater Accra region (322

farms), Ashanti region (212 farms), Brong-Ahafo region (205 farms), and Central region [222 farms] (Amanor-Boadu *et al.*, 2016). Similarly, Andam *et al.* (2017) in an earlier study identified a total of 26 feed mills in Ghana out these, 19 were operated in these regions (Greater Accra region, 5 feed mills, Ashanti region, 5 feed mills, Bono region, 5 feed mills, and Central region, 4 feed mills). Again, a technical and operational audit conducted by Wilson (2017) identified 13 poultry processing facilities in Greater Accra, Ashanti, and Bono regions.

All these regions have at least one public university where agriculture and agricultural related programmes are studied. Universities that participated in this study were selected on this bases, that is being located in the regions were broiler value chain actors study was taking place and also offering agriculture and agriculture related programmes of study. At the same time, the University authorities given consent for the study to be undertaken in the institution, these criteria were met in UCC, KNUST, UENR & AAMUSTED, as such their inclusion in this study.

Study Population

The study population was feed millers, broiler producers, and poultry processors. The rest were live bird sellers or marketers and final-year undergraduate (Level 400) students of four (4) public universities, who were studying agriculture and agriculture-related programmes.

Broiler value chain actors who were targeted in the study, either owned a business in feed milling, broiler production, poultry processing, or marketing of live birds in the Greater Accra, Ashanti, and Bono regions. The students who participated in the study were from the University of Cape Coast (UCC),

Kwame Nkrumah University of Science and Technology (KNUST), the University of Energy and Natural Resources (UENR) as well as the Akenten Appiah-Menka University of Skills Training and Entrepreneurial Development (AAMUSTED). Whereas both males and females were part of the broiler value chain actors and students in the study, there were age differences between the broiler value chain actors and students.

The total sample frame of broiler value chain actors in the Greater Accra, Ashanti, and Bono regions was as follows; 485 broiler farmers, 70 feed millers, 40 poultry processors, and 123 live birds' sellers. Whiles the population of final-year undergraduate agriculture students from the four (4) universities; UCC, KNUST, UENR, and AAMUSTED was 1129.

Sampling Procedure and Sample Size

The four study regions and the universities were purposively selected, they are the leading broiler-producing regions out of the sixteen (16) regions in Ghana (Amanor-Boadu *et al.*, 2016). While the universities were also offering agriculture and agriculture related programmes of study and the authorities consenting for the participation of the institutions in the study. The populations from three of these regions (Bono, Ashanti and Greater Accra regions) where the broiler value chain studies took place were then stratified regionally and a simple random sampling technique used to sample broiler producers. Since the study population was large to allow for the selection of a sample that fit for parametric data analysis. Whiles census was conducted on feed millers, poultry processors, and live bird sellers due to their manageable population. Similarly, a census was conducted on the final year university students as it helped the researcher to control the class and manage the

engagement with the various classes. The simple random sampling technique, however, did not guarantee that the sample was proportional to the population (Bordens & Abbott, 2014).

For actors on the broiler value chain, requests were made to District Departments of Agriculture offices under the Ministry of Local Government and Rural Development (MLGRD) and the offices of the Veterinary Services Directorate of the Ministry of Food and Agriculture (MoFA) as well as Holland Akokor, a company that imports broiler day-old chicks and other poultry production inputs into Ghana to provide a list of the actors they have been working with in the study regions of Greater Accra region, Ashanti region, and Bono region. The pilot study for the value chain actors and students was undertaken in the Central region (Note: on the main students study Central region was part as UCC students participated). These regions were purposively selected since they were the highest known broiler producing regions in Ghana (Amanor-Boadu et al., 2016), it was based on this that the public universities in these regions offering agriculture programmes were included in the study.

Both MLGRD and MoFA officers provided a list of broiler producers, feed millers (toll feed mills and commercial feed mills), poultry processors, and live birds sellers/marketers in their respective districts whiles Holland Akokor provided a list of broiler producers that bought day-old chicks from the input supplying company in the year 2021. The inclusion criteria for broiler producers in this study was for a farmer to have produced broilers between January 2021 to December 2021 and if in the second quarter of 2022 the farmer should have completed disposing the broilers. The list of broiler

producers from MLGRD, MoFA, and Holland Akokor was then pooled regionally and audited to eliminate duplication. Similarly, the list of feed millers, poultry processors, and live bird sellers/marketers received from offices of MLGRD and MoFA were also pooled and audited (see in Table 2).

Table 2: Broiler Value Chain Actors Population and Study Sample Size

Region	Number of Broiler Producers	Sampled Broiler Producers	Sampled Feed millers	Sampled Poultry Processors	Sampled live bird sellers/marketers
Greater Accra	266	171	23	24	45
Ashanti	174	130	18	13	55
Bono	45	44	29	3	23
Total	485	345	70	40	123

Source: MLGRD, MoFA and Holland Akokor (2022)

Final year undergraduate students from UCC, KNUST, UENR, and AAMUSTED populations were sourced from the examination offices of the respective university as shown in Table 3.

Table 3: Final Year Undergraduate Student Population and Study Sample Size

University	Sampled students
University Cape Coast	61
Kwame Nkrumah University of Science and Technology	671
University of Energy and Natural Resources	59
AkentenAppiah-Menka University of Skills Training & Entrepreneurial Development	338
Total	1129

Source: Examination office UCC, KNUST, UENR, and AAMUSTED (2022)

The research was focused on final year students because they were to complete their programmes of study at their respective universities in less than a year at the time of the study. It was, therefore, assumed that since they were about to enter the job market to seek for employment they would be

considering their options for employment than third, second or first year students at the university.

The sample size of 345 from the total population of 485 broiler producers was used based on the Krejcie and Morgan (1970) sample determination table (see appendix A). This was done based on the regional broiler producers' population and while taken into account the volatile nature of the Ghanaian broiler industry and the possibility of a higher nonresponse rate to the questionnaire. For this reason, 10% of the calculated sample size was added as follows; per Krejcie and Morgan (1970) sample determination table, the Greater Accra region with a total number of 266 broiler producers, would give a sample size of 155, 10% of 155≈ 16 (155+16=171). Whereas the sample size for the Ashanti region with a population of 174 broiler producers was 118, 10% of 118 ≈ 12 (118+12=130) and Bono regions' 45 population of broiler producers gave a sample size of 40, 10% of 40= 4 (40+4=44).

The sample was then randomly selected using computer software (Microsoft excel software). This was done by assigning random numbers to all the list, these numbers were then sorted from the smallest to the highest. For each of the regions the sample size per Krejcie and Morgan (1970) sample determination table was first selected before the nonresponse rate of 10% was calculated and added. Table 2 contain the detailed study population and sample size.

Data Collection Instruments

Five (5) data collection instruments were used (see appendix B, C, D, E and F), four were structured interview schedules and one was a questionnaire. They contained both open-ended, and close-ended questions

which were used to collect data for the study. These were designed for feed millers, broiler producers and poultry processors. The rests were live bird sellers and final-year undergraduate agricultural students in four public universities.

To solicit information from the four (4) actors of the domestic broiler value chain that the study focused on, the structured interview schedules were designed in sections. The structured interview schedules for feed millers, broiler producers, and live bird sellers had five sections (A to E), whiles that of the poultry processors contained only four sections (A to D). Section A of each of the actor's structured interview schedule was on their demographic and socio-economic characteristics. The data collected under this section included sex, marital status, age, and the educational level of the actor among others.

Section B was on institutional and regulatory issues regarding the actor's business such as laws or regulations by the state or professional bodies that govern the setting up and operations of their businesses. This section also collected information on the working relationship between actors and state agencies with oversight responsibility on broiler value chain businesses. The third section, section C was on the cost of production, output, and sales by actors. The information collected included fixed inputs costs such as land, building, and rented facilities. Some of the variable cost information collected were the cost of day old-chicks, labour, and feed amongst others. Sales and marketing information was also collected under this section.

Section D was on the channels of marketing. This was for the collection of information on the form in which actors market their products

such as live birds, dressed birds' cuts, or whole birds, and the type of buyers the products are sold to whether the buyers were retailers, institutions, or direct-to-consumer. Information on where the product is sold to buyers such as the type of market or farm gate was also collected under this section. Additionally, the factors that the actor consider before going into production, such as market access or availability for the product and whether the pricing meets the expectation of the actor as well as a mode of payment for products either on delivery, credit, or mobile money among others were all considered under section D.

The last section for the actor's instrument was section E, on production and marketing constraints. It was designed as a five-point Likert scale that measured and ranked the constraints or challenges actors are facing in producing and marketing their products.

The student questionnaire was designed to measure the perceived knowledge level of students on activities of the broiler value chain and their perception regarding choosing broiler value chain activities as a vocation or entrepreneurship after graduation. It was used to collect information on students' demographic and socio-economic characteristics (sex, age, and marital status, where students and their parents live, and the occupation of their parents). The instrument design also allowed for the collection of information that measured the perceived knowledge level of students in various activities along the domestic broiler value chain on a four-point Likert scale (poor, good, very good, and excellent). Interpretation of the four-point Likert scale is contained in Table 4.

Table 4: Interpretation of Likert scale used to measure the perceived knowledge of undergraduate students

Rating	Interval or Range	Knowledge level
4	3.45 - 4.00	Excellent
3	2.45 - 3.44	Very good
2	1.45 –2.44	Good
1	1.00 –1.44	Poor

Source: Author's Construct (2022)

Information on the type of job the respondents would want to do after their undergraduate degree in agriculture or agriculture-related programme was also collected. Those interested in broiler value chain activities were required to select and ranked five activities of interest to them. The final part of the instrument was a five-point Likert scale of one to five (1-5), where 1= Strongly Disagree, 2= Disagree, 3= Somewhat Agree, 4= Agree, and 5= Strongly Agree. Under the following four constructs (variables): socio-cultural perception, economic perception, government policy perception, and resource availability perception. These were aimed at measuring their perception toward engaging in activities of the domestic broiler value chain and what would drive their engagement and choice of activity along the chain. Table 5 contained the summary of the Likert scale and the respective interpretations.

Table 5: Interpretation of Likert scale used to measure perception of undergraduate students

Rating	Interval or Range	Level of agreement
5	4.45 – 5.00	Strongly agree
4	3.45 – 4.44	Agree
3	2.45 – 3.44	Somewhat agree
2	1.45 – 2.44	Strongly disagree
1	1.00 – 1.44	Disagree

Source: Author's Construct (2022)

Bordens and Abbott (2014), have stressed the importance of range effects on research outcomes. Noting that, range effects can be classified as floor or ceiling. Either of them if measures are not taken to prevent or control would alter the study's central tendency and reduce the effect of independent variable(s). The researcher has, therefore, taken cognisance of this, and ameliorating measures have been put in place. Hence, the range for the interpretation of the Likert scale responses presented in Tables 4 & 5 above.

The Likert scale is a self-reporting measure that is used to measure attitudes and other human behaviour (Bordens & Abbott, 2014). The use of the Likert scale to measure the perception of final year undergraduate students toward their engagement in broiler value chain activities is due to the robust correlation coefficient of Likert scale, which limits data distortions caused by ordinal data (Conradie & Piesse 2016 as cited in Magagula & Tsvakirai, 2020).

Ethical Clearance

Prior to the commencement of the pretesting of the interview schedules and questionnaire, approval for ethical clearances was sought from the Institutional Review Board of the University of Cape Coast. This application expressed the commitment of the researcher to undertake the data collection exercise with respondents in an ethically acceptable manner that generates knowledge for the benefit of all. After the institutional review board reviewed the application which included the research proposal and data collection instruments, approval for the conduct of the research was granted, a copy of the approval letter is attached in appendix G.

Pilot Study

A pilot study was undertaken in the Central region to pre-test the questionnaire, four actors of the domestic broiler value chain (feed millers, broiler producers, poultry processors, and live bird sellers) and final-year undergraduate students in the general agriculture and animal production programmes of study in the University of Cape Coast participated in the study. However, the remaining agricultural programmes of study in the University of Cape Coast was then included in the main study.

The structured interview schedules and questionnaire used for the pilot studies were submitted by the researcher to the team of supervisors for a review that ensured content validity amongst others. Changes were made based on their recommendations. The researcher and two (2) trained enumerators administered the interview schedules and questionnaire from the 27th of January 2022 to the 16th of February 2022. Actors of the domestic broiler value chain were visited at their business premises and interviews were conducted to complete the interview schedule. Whiles, the students were met in their classrooms and the questionnaire was explained to them before they completed it.

The number of respondents that were interviewed during the pre-test were feed millers 1, broiler producers 20, poultry processors 4, live bird sellers/marketers 8, and final-year undergraduate students 41.

The data collected were then sorted, cleaned, and entered in a Statistical Product and Service Solutions (SPSS) version 28, to generate the reliability coefficients for the Likert typed items in the research instrument.

The reliability was estimated using the Cronbach alpha statistic and the results are shown in Table 6.

Table 6: Cronbach Alpha Reliability Analysis of Subscale of the Research Instruments of the Broiler Value Chain actors and Final-year Undergraduate Students

Construct	Cronbach's alpha	Number of Items
Final year University Students		
Socio-cultural perception	0.745	13
Economic perception	0.603	3
Government Policy perception	0.485 (0.696)	3 (7)
Resources availability perception	0.743	6
Marketers		
Marketing of broiler constraints	0.856	9
Broiler producers		
Broiler production constraints	0.790	18
Broiler marketing constraints	0.614	4

Source: Pilot Study, Tuoho (2022)

The SPSS software analyses the scale items to generate Cronbach's Alpha coefficient to find the reliability of all items. For an instrument to be reliable, it must give consistent results when used by different researchers in similar studies. To this end, Loewenthal (2004) noted that an alpha coefficient of 0.60 or more depicts that the subscales on the research instrument are reliable. On the contrary, Fraenkel and Wallen (2000) pointed out that, a reliability coefficient of 0.70 or better is acceptable for social research. This has been corroborated by Abington- Cooper (2005) who argued that a reliability coefficient of 0.70 is good and that such an instrument be judged as acceptable for data collection. This notwithstanding, Vaske (2008) posited that an alpha level of 0.65 or more on a sub-scale is reliable and acceptable to be used in social research.

The Cronbach's Alpha of six constructs namely, socio-cultural perception of students, economic perception, government policy perception, resources availability perception, marketing constraints subscale and production constraints were computed. The results as presented in Table 6 above indicates that the Cronbach alpha coefficients ranged from 0.485 to 0.856. It was revealed that the coefficient of government policy was low. This was attributed to the few number of items in the construct. Hence, the researcher increased the number of items under the government policy perception construct from 3 items to 7 items. This increased the alpha coefficient of the government policy construct from 0.485 to 0.696. It was therefore, found to be reliable. That notwithstanding all the other constructs were adjudged as acceptable to be used for the actual data collection.

Data Collection Procedure

A total of 19 trained enumerators and the researcher collected the data for the study. The enumerators were mostly staff of the District Departments of Agriculture under the Ministry of Local Government and Rural Development. They visited and administered the structured interview schedules to actors of the domestic broiler value chain face to face to avoid the wrong filling of the interview schedules. These interview schedules were administered mostly in the English language. However, for those actors who did not understand the English language, it was done in the local language that they understood such as Ga, Twi, or Bono.

The researcher visited university campuses to administer the questionnaire to final-year undergraduate students. Students were met at their classrooms and taken through the questionnaire, after which those who did not

understand certain aspects were given further explanation. The students were then allowed to complete the questionnaire. Both actor and student data collections began on the 14th of March 2022 and ended on the 26th of August 2022.

At the completion of the data collection exercise, 289 out of the 345 structured interview schedules for broiler producers were retrieved, this represented a response rate of ≈ 83.8%. Whiles 53 out of 70 interview schedules administered were retrieved from feed millers representing 76%, for poultry processors 29 out of the 40 administered interview schedules were retrieved representing ≈73%, and 106 out of the 123 interview schedules administered to live bird sellers/marketers were retrieved representing ≈ 86.2%. Regarding questionnaire administered to final-year undergraduate students a total of 1129 questionnaire were administered and 728 were returned representing ≈ 64.5%. The more than 60% retrieval rate of the questionnaire across the five study populations implies that the results of the study is statistically valid.

Data Processing and Analysis

The data obtained was coded and entered in excel spread sheet, Statistical Product and Service Solutions (SPSS) version 28.0 and Stata version 17.0. It was then cleaned to remove all identifiable data entry errors while issues of missing data were addressed by reverting to the completed interview schedules and questionnaire in some instances to correct the anomaly. The software's that were used to analyse all the data was Stata version 17.0 except for the analysis of variance (ANOVA) and computing the

means for the perceived knowledge and perception that SPSS was used. The presentation of the rest of the data analysis section is based on objectives.

Objective 1

This objective was focused on mapping and developing a matrix of SWOT analysis of the domestic broiler value chain in the study regions. Data was collected through structured interview schedules and information in documents sourced from the Animal Production Directorate and Veterinary Services Directorate of MoFA as well as scientific publications (Animal Production Directorate, 2021; Veterinary Services Directorate, 2021). The field data collected was analysed as descriptive statistics, such as frequencies, percentages, means, and standard deviations. The documents and scientific literature were reviewed and triangulated with the results of the field data to develop the map of major activities of the domestic broiler value chain for the three study regions and the matrix of SWOT analysis.

Domestic Broiler Value Chain Mapping

The value chain mapping framework is an important tool used in many spheres of business to engender growth through linkages and trust building which often results in value addition and product differentiation. It has been used extensively in the agribusiness space including the broiler industry. According to Bezabih et al. (2020) the core goal of value chain analysis is to ensure an effective means of improving the performance of the chain and its actors.

To achieve this, there was the need to map the chain, according to existing literature, Goitom et al. (2018) in a study to calculate the profit margins of actors along the poultry value chain in Adwa Wereda, Ethiopia.

The author mapped the poultry value chain in the study area. Additionally, in a study that focused on livestock feed value chains and feed related issues in Ethiopia, the authors also conducted a stakeholder analysis and net mapping of the value chain (Bezabih et al., 2020).

Similarly, Onumah et al. (2021) in a study that focused on the broiler sector of southern Ghana used the foreign investment advisory service (FIAS) framework to map the broiler value chain actors and their linkages. The current study draws from these empirical studies and others to map the domestic broiler value chain of the three study regions. The main activities were identified based on the aspects of the chain that this study was focused on as feed milling, broiler production, live birds selling or marketing, poultry processing and consumption. Each of these activities led to a product and an end-user or consumer as well as the accompanying support service provider. The pathways and marketing channels were all linked through a flow chart.

SWOT Analysis of Domestic Broiler Value Chain

SWOT analysis is a tool or technique used to evaluate or identify the strengths, weaknesses opportunities and threats to the growth or development of businesses, projects or a given activity (Tantawy et al., 2018). It is critical to conduct SWOT analysis for businesses or projects as it helps keep such entities competitive (Zoller & Bruynis, 2007). Competitiveness is a critical ingredient for the survival of agribusinesses such as those in the broiler value chain. Hence, a SWOT analysis of the EU poultry meat sector that was carried out (van Horne & Bondt, 2013). In addition to this is a study by Onumah et al. (2021) that conducted SWOT analysis in their study of the broiler value chain of selected regions in Ghana.

Considering the results of the study data and reviewed literature the SWOT analysis matrix was developed with the strengths and weaknesses capturing the internal or controlled factors of the broiler value chain whiles the opportunities and threats dealing with the external or factors that cannot be controlled by the actors including macroeconomics and others. The strengths and opportunities were also viewed in the light of being helpful or positive to the growth of the domestic broiler value chain. Whereas the weaknesses and threats were considered harmful or negative to the growth of the domestic broiler value chain.

Objective 2

The ranking of challenges or constraints has been done using various statistical tools and techniques such as Spearman's rank correlation coefficient, Garrett's ranking technique, direct scoring method and Kendall's coefficient of concordance (Boakye, 2020). This study, however, chose the Kendall's coefficient of concordance technique for analysing the challenges confronting major actors and their activities in the domestic broiler value chain.

Kendall's coefficient of concordance (W) is a measure that uses ranks to assess agreement between observers (Kendall & Babington Smith, 1939 as cited in Gearhart et al., 2013; Legendre, 2005). It is like Spearman's rank correlation coefficient, the only difference is that Spearman's rank correlation can only compare two observers at a time while Kendall's W can compare more than two observers at a time and is simple and efficient to use (Gearhart et al., 2013). Hence the decision to employ the use of Kendall's W for this study.

This agreement or consensus among the rankers is indicated by the coefficient, to show whether agreement reached is increased or decreased among the observers (Fonseca & Picoto, 2020). To enhance the interpretation of the values of the Kendall W. Schmidt (1997) proposed the following guidelines; a Kendall W of 0.1 means very weak agreement with a confidence in rank being none. A Kendall W of 0.3 means a weak agreement and the confidence in rank is low, while a Kendall W of 0.5 shows a moderate agreement with a fair confidence in rank. However, a Kendall W of 0.7 means a strong agreement and a confidence in rank as high. Whereas a Kendall W of 0.9 shows an unusually strong agreement with a very high confidence in rank. These guidelines by Schmidt (1997) has been adopted by this study for the interpretation of the agreement in ranking the challenges of the Ghanaian broiler value chain by actors.

Kendall's W has been used to measure the level of agreement among observers in studies that identified tree species by Gearhart et al. (2013) and Legendre (2005), as well as assess the similarities of pension systems (Marcinkiewicz, 2017). In agricultural value chains studies, the use of Kendall's coefficient of concordance to rank the challenges faced by actors is well documented. These include Etuah (2014) who measured the cost efficiency levels and economies of scale of broiler farms in Ashanti region and ranked the constraints of the broiler producers. Similarly, Boakye (2020) analysed the value-added activities in the pineapple value chain in selected districts of the Central region of Ghana and ranked the constraints of the actors as well.

Objective 3

Profitability analysis of selected broiler value chain activities in three major poultry producing regions of Ghana was carried out. First by analysing the gross margin, and then profit share of major actors along the broiler value chain. Subsequently, the stochastic frontier profit efficiency model was estimated to examine profit efficiency levels of the major actors of the broiler value chain. The analytical frame is presented in the following section.

Gross Margin (GM)

Gross margin describes the amount of profit that a firm makes after paying for its cost of goods sold. It is calculated as;

$$\pi' = R - C$$

Where: π'= Gross Margin, R = Revenue and C = Cost of goods sold

Profit Share Among Major Actors

The sharing of gross profit among the majors broiler value chain actors was based on the following relation:

$$\pi'_{BLP} = \frac{x}{\Sigma\pi'} \times 100\%$$

Where: π'_{BLP} = Profit share, x = gross margin of major actor, $\sum\pi' = sum\ of\ gross\ margin\ of\ major\ actors$

Analytical Framework for Profit Efficiency Estimation

According to Battese (1992) the econometric modelling of frontier production functions makes it possible to compare different firms' production efficiency. A concept that was started by Farrell (1957) following the observation that if a production function (frontier) to be estimated has constant returns to scale then, the input-per-unit-of-output values observed for the firm would be above the so-called *unit isoquant*. Which defines the input-per-unit-

of-output ratios linked with the most efficient use of the inputs to produce the output involved. If deviations are observed in the input-per-unit-of-output ratios from the *unit isoquant*, it is associated with the technical inefficiency of the firms involved.

Technical inefficiency is one of the three measurements of production inefficiency, the other two are scale and allocative inefficiency (Rahman, 2003). The ability of a business to achieve the highest level of profit given the fixed factors of the firm and prices is said to be profit efficiency. On the contrary, profit inefficiency is when a firm is unable to achieve the highest level of profit, but a loss of profit. Which can be attributed to the firm's failure to operate in the frontier (Ali & Flinn, 1989).

Through a profit maximisation framework technical inefficiency, scale, and allocative inefficiency are estimated together with production decision errors translated into lower profits. They are mostly measured using the production frontier approach. Among the different types of frontier production models, the stochastic frontier model is used to address concerns raised regarding differences in the prices and factor endowment of farmers. Hence the use of the stochastic frontier model to estimate efficiencies that are specific to a given firm (Rahman, 2003).

The stochastic frontier model was proposed independently by Aigner et al. (1977), and Meeusen and Van den Broeck (1977) and has been used since the last half of the 20th century to analyse both technical efficiency and allocative efficiency (Yevu & Onumah, 2021). Under the stochastic frontier profit efficiency model, the possible production is bounded above by the stochastic quantity. The econometric modelling of stochastic frontier

production function shares light on best practices in applying technology and means by which different firms' or businesses' productive efficiency can be compared (Battese, 1992). It is also able to differentiate the effects of noise from inefficiency effects (Etuah, 2020).

Therefore, this study draws from Rahman (2003), Wongnaa et al. (2019), and Yevu and Onumah (2021) in using a profit function model that is consistent with the stochastic frontier model as prescribed by Battese and Coelli (1995). The stochastic frontier model is known to conform to parametric analysis (Arbelo et al., 2021). Hence, the use of the stochastic frontier profit model in the current study to estimate the profit efficiency of major broiler value chain actors with cross-sectional data that is fit for parametric analysis.

Empirical Model for Estimating Profitability Among Major Broiler Value Chain Actors

The model for estimating profit efficiency among broiler producers, live bird sellers, and poultry processors in the study area is presented as follows.

$$\pi_i = f(P_i, x_i).exp\varepsilon_i \qquad (1)$$

where $i = 1 \ldots\ldots n$ number of broiler producers, live bird sellers, and poultry processors in the study sample.

π_i = normalize profit of the i^{th} broiler farm, live bird selling business, and poultry processing business estimated as gross revenue subtracted from variable cost and divided by the output price of the broiler farm, live bird selling business, and poultry processing business or business concerned.

P_i = vector of variable input price of i^{th} broiler farm, live bird selling business, and poultry processing business dived by output price. X_i = vector of fixed factor of the i^{th} broiler farm, live bird selling business, and poultry processing business. 'exp' = exponential function, ε_i = error term,

$$\varepsilon_i = v_i - \mu_i \qquad (2)$$

v_i = symmetric random error or noise error term that is uniformly and independently distributed and beyond the control of broiler producers, live bird sellers, and poultry processors (inclement weather, national economic crises such as currency depreciation, and disease outbreak e.g. bird flu) by truncation at zero (0) the distributed normal mean as $[N(0, \sigma\frac{2}{V})]$. μ_i = non-negative random variable, associated with the inefficiency in production. Mean $\mu_i = \delta O + \Sigma_{d=1}^{n} \delta_d x_{d_i}$ and Variance $\sigma\frac{2}{\mu}$ = $(u \sim N\ (\mu i,\ \delta^2 u))$. X_{di} = d^{th} explanatory variable regarding inefficiencies on broiler farm, live bird selling business, and poultry processing business i and δ_0 and δ_d are the unknown parameters to be estimated. In this regard the profit efficiency of broiler farm, live bird selling business, and poultry processing business *i* stochastic frontier profit function can be defined as:

$$PE_i = E[\exp(-\mu)|\varepsilon_i] = E[\exp(-\delta_0 - \sum \delta_d x_{di})|\varepsilon_i] \qquad (3)$$

PE =profit efficiency of broiler farmer, live bird selling business, and poultry processing business i that lies between 0 and 1 and is inversely related to the level of profit inefficiency, where E = expectation operator of μ_i based on the on ε_i. The maximum likelihood method is employed in estimating the unknown parameters in which the stochastic profit frontier and inefficiency effects are simultaneously estimated (Yevu & Onumah, 2021).

The estimation of the profit efficiency of broiler producers, live bird sellers, and poultry processors in the study area was done by conducting model fitness test to simultaneously estimate the maximum likelihood ratio using the Translog profit function and Cobb-Douglas production function to ascertain which one best fit the data set (Wongnaa et al., 2019). Below is the maximum likelihood function $\gamma = \delta^2 u/\delta^2$, where $\delta^2 = \delta u^2 + \delta v^2$ (Yevu & Onumah, 2021).

The specification of the empirical model for estimating broiler producer's profit efficiency

Translog profit function

The profit efficiency function for broiler farms is empirical specified below.

$$In\pi_i = \beta_0 + \sum_{j=1}^{5} \beta\, ; ln\, P_{ji} + 0.5 \sum_{j=1}^{5}\sum_{k=1}^{5} B_{jkInP_{ji}InP_{k_i}+V_i-u_i} \quad (4)$$

$$Iny = \beta_0 + \beta_1 In(feed_i) + \beta_2 In(V\,accin\,e_i) + \beta_3 In(Mis_i) + \beta_4 In(DOC_i) + \beta_5 In(\text{Others}_i) + \beta_6 (0.5 * In(Fee\,di)^2) + \beta_7 (0.5 * In(0thers_i) + \beta_8 (0.5 * In(DOc_i)^2) + \beta_9 (0.5 * In(Vaccine_i)^2) + \beta_{10} (0.5 * In(Mis_i)^2) + \beta_{11} (In(DOc_i) * In(Fee\,d_i)) + \beta_{12} (In(DOc_i) * In(Vaccine_i)) + \beta_{13} (In(DOc_i) * In(Mis_i)) + \beta_{14} (In(DOc_i) * In(Others_i)) + \beta_{15} (In(Fee\,d_i) * In(Vaccine_i)) + \beta_{16} (In(Fee\,d_i) * In(Mis_i)) + \beta_{17} (In(Fee\,d_i) * In(Others_i)) + \beta_{18} (In(Vaccine_i) * In(Mis_i)) + \beta_{19} (In(Vaccine_i) * In(Others_i)) + \beta_{20} (In(Others_i) * In(Mis_i)) + (v_i - \mu_i) \quad (5)$$

Cobb-Douglas production

$$Iny = \beta_0 + \beta_1 In(Fee\,d_i) + \beta_2 In(Vaccine_i) + \beta_3 In(Mis_i) + \beta_4 In(DOc_i) + \beta_5 In(Others_i) + (v_i - \mu_i) \quad (6)$$

where: In = denotes natural logarithm; i = ith broiler farm, πi (y) = normalised gross profit per bird for ith broiler farm Pi's = normalised variable input prices Pk = price of input k used by the ith broiler farm (i = j = 1, 2, 3, 4, and 5); βo,βi, βik, βim and β_X are parameters to be estimated. The effects of

random technical efficiencies are represented by v_i and μ_i. The inefficiency model is specified as

$$\mu_i = \delta_0 + \delta_1 age\_brroiler\_producer + \delta_2 formal\_edu\_level + \delta_3 membership\_pfa + \delta_4 sex + \delta_5 family\_labour + \delta_6 ever\_access\_credit + \delta_7 extension\_service \quad (7)$$

Following Battese and Coelli (1995) a generalized likelihood ratio test for the Translog profit function model and the Cobb- Douglas production function model was carried to determine which model is appropriate for the data set. The log-likelihood ratio test result shows a Translog profit function ratio of -86.855 while the ratio for Cobb-Douglas production function was -117.810. Since -86.855 is larger, the Translog profit function was selected over the Cobb-Douglas production function that recorded a lesser log-likelihood ratio test result of -117.810. This implies that the Translog profit function was more flexible than the Cobb- Douglas production function and fits broiler production in the study area (Wongnaa et al., 2019). The explanatory variable for the model is presented in Table 7.

$$\mu_i = \delta O \sum_{d=1}^{10} \delta_d x_{d_i} \quad (8)$$

Table 7: Explanatory Variables for Broiler Farms Profit Efficiency Model and the Expected Signs

Variable	Description of variable	Expected sign	Source
π'	Normalised profit (gross margin) in GH¢ is the total revenue of the broiler farm less the variable cost		
P_1**(Feed$_p$)**	Normalised price of broiler feed	+/-	Yevu and Onumah (2021), Tuffour and Oppong (2014),Nganga et al. (2010)
P_2 **(Vaccine$_p$)**	Normalised price of vaccines for broilers	+	Yevu and Onumah (2021)
P_3**(Mis$_p$)**	Normalised price of veterinary medications for broilers	+/-	Yevu and Onumah (2021),Tuffour and Oppong (2014)

Table 7: Continue

P_4 **(DOC_p)**	Normalised price for broiler DOC	+/-	Yevu and Onumah (2021), Tuffour and Oppong (2014),Chibanda Musaba and Chibalani (2021)
P_5**(Other cost$_p$)**	Normalised cost of other inputs including transportation, water, electricity,wood shavings and char charcoal.	-	Yevu and Onumah (2021), Tuffour and Oppong (2014),
δ_o	Intercept term		
X_d	Variables that explains inefficiency effects (d = 1,…,..,7)		
X_1	Age of broiler producer in years who make decisions for the farm	+	Wongnaa et al. (2019), Yevu and Onumah (2021), Tuffour and Oppong (2014
X_2	Formal education level of broiler producer	-	Wongnaa et al. (2019)
X_3	Poultry farmers' association membership by broiler producer (1 = if a member, 0 = otherwise)	-	Wongnaa et al. (2019)
X_4	Sex of broiler producer (male =1, female = 0)	-	Wongnaa et al. (2019)
X_5	Family labour use by broiler producer	-	Tuffour and Oppong (2014), Hirwa (2018)
X_6	Ever access credit (1 = access to credit, 0 = no access to credit)	-	Wongnaa et al. (2019, Tuffour and Oppong (2014)
X_7	Extension service [number of contacts] (1 = yes, 0 = no)	+/-	Wongnaa et al. (2019), Yevu and Onumah (2021), Tuffour and Oppong (2014),Chibanda Musaba and Chibalani (2021)

Note: The gross margin of variables was divided by each broiler producer's business specific bird prices to normalize the variables. Source: Authors Construct, (2022).

Specification of the Empirical Model for Estimating Live Bird Sellers Profit Efficiency

The specification of the empirical model is as follows:

Translog profit function

$$In\pi_i = \beta_0 + \sum_{j=1}^{3} \beta\,; ln\, P_{ji} + 0.5 \sum_{j=1}^{3}\sum_{k=1}^{3} B_{jkInP_{ji}InP_{k_i}+V_i-u_i} \quad (4)$$

$$Iny = \beta_0 + \beta_1 In(birds_i) + \beta_2 In(labour_i) + \beta_3 In(COB_i) + \beta_4(0.5 * In(labour_i)^2) + \beta_5(0.5 * In(COB_i)^2) + \beta_6(0.5 * In(Birds_i)^2) + \beta_7(In(Labour_i) * In(COB_i)) + \beta_8(In(Birds_i) * In(COB_i)) + \beta_9(In(Birds_i) * In(Labour_i)) + (v_i - \mu_i)$$

(5)

Cobb-Douglas production

$$Iny = \beta_0 + \beta_1 In(Birds_i) + \beta_2 In(Labour_i) + \beta_3 In(COB_i) + (v_i - \mu_i)$$

(6)

Where: In = denotes natural logarithm, i = ith live bird seller, π_i (y) = normalised gross profit per bird for i^{th} live bird selling business, Pi's = normalised variable input prices, Pk = price of input k used by the i^{th} live bird seller (i = j = 1, 2, 3, 4, and 5); βo,βi, βik, βim and β_X are parameters to be estimated. While, the effects of random technical efficiencies are represented by v_i and μ_i. The inefficiency model for live bird sellers is therefore specified as:

$$\mu_i = \delta_0 + \delta_1 Sex_i + \delta_2 age_i + \delta_3 education\_level_i + \delta_4 ever\_access\_credit_i + \delta_5 house\_size_i$$

(7)

Following Battese and Coelli (1995) a generalized likelihood ratio test for the Translog profit function model and the Cobb- Douglas production function model was carried to determine which model is appropriate for the data set. The log-likelihood ratio test results of live birds sellers' data in the study for the Translog profit function ratio was 7.128 while Cobb-Douglas production function had -35.814. Translog profit function was, therefore, selected over the Cobb-Douglas production function as it is the best fit for the live bird's seller's data in the study area (Wongnaa et al., 2019). The explanatory variable for the model is presented in Table 8.

$$\mu_i = \delta O \sum_{d=1}^{6} \delta_d x_{d_i} \quad (8)$$

Table 8: Explanatory Variables of Live Birds Sellers Profit Efficiency Model and the Expected Signs

variable	Description of variable	Expected sign	Source
π'	Normalised profit (gross margin) in GH¢ is the total revenue of the live bird seller less the variable cost		
P_1**(Birds$_p$)**	Normalised price of birds from producers or contract growers	+/-	Ayieko et al. (2014), Gbigbi and Chuks-Okonta (2020)
P_2 **(Labour$_p$)**	Normalised price of labour	+/-	Dziwornu and Sarpong (2014), Wongnaa et al. (2019),Yevu and Onumah (2021), Chibanda and Chibalani (2021)
P_3**(COB-Othercost$_p$)**	Normalised cost of other inputs including transportation, water, electricity, wood shavings and feed.	-	Yevu and Onumah (2021), Dziwornu and Sarpong (2014)
δ_o	Intercept		
X_d	Variables that explains inefficiency effects (d = 1,…,..,5)		
X_1	Sex of live bird seller (male =1, female = 0)	-	Yevu & Onumah (2021)
X_2	Age of live bird seller making primary decisions	+	Dziwornu and Sarpong (2014) and Yevu & Onumah (2021).
X_3	Educational level of live bird seller	-	Wongnaa et al. (2019)
X_4	Ever access credit (1 = access to credit, 0 = no access to credit)	-	Dziwornu and Sarpong (2014) and Wongnaa et al. (2019)
X_5	Household size of live bird seller	-	Wongnaa et al. (2019)

Note: The gross margin of variables was divided by each live bird selling business specific bird prices to normalize the variables. Source: Authors Construct, (2022).

Specification of the Empirical Model for Estimating Poultry Processors Profit Efficiency

The specification of the empirical model is as follows:

Translog profit function

$$In\pi_i = \beta_0 + \sum_{j=1}^{2} \beta\, ; ln\, P_{ji} + 0.5 \sum_{j=1}^{2}\sum_{k=1}^{2} B_{jkInP_{ji}InP_{k_i}} + V_i - u_i \quad (4)$$

$$Iny = \beta_0 + \beta_1 In(Birds_i) + \beta_2 In(COB_i) + \beta_3(0.5 * In(COB_i)^2) + \beta_4(0.5 * In(Birds_i)^2) + \beta_6(In(Birds_i) * In(COB_i)) + (v_i - \mu_i) \quad (5)$$

Cobb-Douglas production

$$Iny = \beta_0 + \beta_1 In(Birds_i) + \beta_2 In(COB_i) + (v_i - \mu_i) \quad (6)$$

Where: In = denotes natural logarithm, i = ith poultry processor, πi (y) = normalised gross profit per bird for i^{th} poultry processing business. Pi's = normalised variable input prices, Pk = price of input k used by the i^{th} poultry processor (i = j = 1, 2, 3, 4, and 5). βo, βi, βik, βim and β_X are parameters to be estimated. However, the effects of random technical efficiencies are represented by v_i and μ_i. The inefficiency model for poultry processors in the study area is, therefore, specified as:

$$\mu_i = \delta_0 + \delta_1 age + \delta_2 level\_education + \delta_3 membership\_ppa + \delta_4 ever\_access\_credit + \delta_5 household\_size \quad (7)$$

Following Battese and Coelli (1995) a generalized likelihood ratio test for the Translog profit function model and the Cobb- Douglas production function model was carried to determine which model is appropriate for the data set. A model fitness test using the log-likelihood ratio show a result of 63.397 for the Translog profit function and 1.263 for the Cobb-Douglas production function. In view of the results the Translog profit function was

selected over the Cobb-Douglas production function as it is the best fit for the data of poultry processors in the study area (Wongnaa et al., 2019). The explanatory variable for the model is presented in Table 9.

$$\mu_i = \delta O \sum_{d=1}^{4} \delta_d x_{d_i} \quad (8)$$

Table 9: Explanation of Variables Employed in Estimating Poultry Processors Profit Efficiency and the Expected Signs

variable	Description of variable	Expected sign	Source
π'	Normalised profit (gross margin) in GH¢ is the total revenue of the poultry processor less the variable cost		
P_1**(Birds$_p$)**	Normalised price of birds from producers or contract growers	+	Boakye (2020)
P_2 **(COB-Othercost$_p$)**	Normalised cost of other inputs including transportation, water, electricity, holding pens and feed.	-	Dziwornu and Sarpong (2014), and Yevu and Onumah, (2021)
δ_o	Intercept		
X_d	Variables that explains inefficiency effects (d = 1,…,..,5)		
X_1	Age poultry processor (primary decision maker)	+	Dziwornu and Sarpong (2014), and Yevu and Onumah, (2021)
X_2	Level of education	-	Yevu and Onumah, (2021), Wongnaa et al. (2019)
X_3	Membership of poultry processors association (1 = if a member, 0 = otherwise)	-	Wongnaa et al. (2019)
X_4	Ever access credit (1 = access to credit, 0 = no access to credit)	-	Dziwornu and Sarpong (2014), Wongnaa et al. (2019)
X_5	Household size	-	Wongnaa et al. (2019)

Note: The gross margin of variables was divided by each processing business specific process bird prices to normalize the variables. Source: Authors Construct, (2022).

Objective 4

Key debates Regarding the Use of Likert Scale

In assessing the perceived knowledge level of students in broiler value chain activities and examining their perception toward engaging in broiler value chain activities after graduation. The measurement of their perceived knowledge level was done using a four-point Likert scale. Whiles the assessment of their perception towards engaging in the domestic broiler value chain as a vocation after graduation was measured using a five-point Likert scale.

However, there has been arguments on the appropriate use of Likert scale, particularly as a scale of measurement and the type of data analysis appropriate for data collected from it (Likert scale) use can be subjected to. The leading lights for these arguments has been Jamieson (2004), who noted that Likert scale data are non-parametric since they are collected as ordinal data. However, Carifio and Perla (2007) observed that even if Likert response format yield ordinal item responses their drive scale is interval. Further, Carifio and Perla (2008) have clarified that parametric statistics are robust and can be used to analysed Likert scale data particularly when there are four to eight items in a scale or sub-scale.

Contributing to this debate, Norman (2010) averred that irrespective of sample size being small and having unequal variance, Likert scale data can be used for parametric statistical analysis. The data for this study was collected on a four-point and five-point Likert scale with seven or more items (statements) in each sub-scale or basket, hence the data fits the descriptions

posited by Carifio and Perla (2007), and Norman (2010) as a requirement for the use of parametric statistics to analyse the data.

Against this backdrop, the data analysis that was carried out in lieu of satisfying objective four includes descriptive statistics and inferential statistics. The descriptive statistics were means, standard deviations, frequencies, and percentages. The inferential statistics that were used was the analysis of variance (ANOVA), below is the detailed procedure.

Assessing the Perceived Knowledge Level of Undergraduate Final Year Students in Broiler Value Chain Activities

The perceived knowledge level of students in broiler value chain activities was measured on a four- point Likert scale (1 = Poor, 2 = good, 3 = very good, 4 = excellent). The weighted mean score for each statement was computed based on students' response to the knowledge statements.

$$MS = \frac{\sum w*f}{N} \quad \text{..... (1)}$$

MS =mean score for the *ith* knowledge statement

w = ranked value for the *ith* knowledge statement

f = total number of respondents assigning value w to a knowledge statement *i*

N = total number of respondents

The overall knowledge index (KI) is then computed as

$$KI = \frac{\sum MS}{NS} \quad \text{..... (2)}$$

NS = total number of knowledge statements

Examine the Perception of Final Year Undergraduate Students Towards Engaging in Broiler Value Chain Activities after Graduation

The perception of students was measured using a 5-point Likert scale (1=strongly disagree; 2= disagree, 3 = somewhat agree, 4= agree, and

5=strongly agree). The weighted mean score for each statement was computed based on students' response to the perception statements. This was computed as follows.

$$MS = \frac{\sum w*f}{N} \quad \text{..... (1)}$$

MS =mean score for the *ith* perception statement

w = ranked value for the *ith* perception statement

f = total number of respondents assigning value w to a perception statement *i*

N = total number of respondents

The overall perception index (PI) is then computed as

$$PI = \frac{\sum MS}{NS} \quad \text{..... (2)}$$

NS = total number of perception statements

The overall perceived knowledge and perception of the various statements were calculated and then computations based on universities and programmes of study was then done and the composite means compared.

Analysis of Variance (ANOVA)

There were four one-way analysis of variance (ANOVA) test carried out, the first two determined the statistically significant differences in the perceived knowledge level of students in UCC, KNUST, UENR, and AAMUSTED on the domestic broiler value chain and their perception on four constructs (social-cultural, economic perception, government policy perception and resource availability perception). That measured their willingness towards engaging in broiler value chain activities as a vocation after graduation.

The other two were focused on determining the statistically significant differences between the perceived knowledge level of students in broiler value

chain activities and the perception of students toward engaging in broiler value chain activities as a vocation after graduation in the four public universities named above but with the independent variable being the programmes of study by students. These programmes include agribusiness, animal science, agricultural biotechnology, crop science, agro-processing, agricultural extension, and agricultural economics.

Since the ANOVA test is an omnibus test, it only shows statistical significance, after each of the four test that were carried out, a follow-up post hoc test was done for those variables that were found to be statistically significantly different (Pallant, 2016). This was preceded by a Levene homogeneity of variance test to ascertain whether equal variance was assumed or not assumed in order that the appropriated post hoc test can be recommended.

The Tukey HSD post hoc test and Fisher's Least Significant Difference (LSD) Test were used in cases where the Levene homogeneity of variance test was not statistically significantly different, an indication that equal variance was assumed. Given that the means being subjected to the analyses generally had small differences coupled with the fact that sample sizes of both the dependent and independent variables were also not equal the Tukey HSD and LSD post hoc test were used interchangeable (Williams & Abdi, 2010). Where the Levene homogeneity of variance test was significant, implying that equal variance was not assumed. The Tamhane post hoc test was carried out to identify where the significant differences exist among the various student groupings.

Objective five (5)

The analytical procedure for objective 5 was mainly inferential statistics involving regression models. Two types of regression models were used, the probit regression and the multivariate probit regression model. The detailed model specification is as follows.

Probit Model for Students Decision to Choose Broiler Value Chain as a Business Occupation

The study sought to identify the factors that influence students' decision to engage in broiler value chain activities as a vocation after graduation using the probit regression model. It is a discrete choice model and contingent on the utility maximisation theory (Greene, 2003 as cited in Dadzie, 2016). The probit regression model was used due to the binary nature of the dependent variable and the ability of the probit regression model to fit a maximum likelihood model when the dependent variable is binary in nature. The probit model operates with the assumption that the standard normal cumulative distribution function, influences the outcome of a positive probability (Gujarati, 2002).

The marginal effects, magnitude of change in the dependent variable because of change in the in the regressors, must be calculated when the probit model is used. Marginal effects measure the conditional change in the dependent variable resulting from a unit change in the independent variable (Cameron & Trivedi**,** 2010: 343).

As a choice model, a student d, faced with making decision on an option k, would choose k among the alternatives if the k-th option maximise his or her utility (Aleskerov et al., 2007). A student has the option to choose to

engage in the broiler value chain or not to choose broiler value chain activities as a vocation after graduation in order to maximise his or her utility, this is presented as;

$$BB_{kd} = Max(BB_{1d}, BB_{2d}) \quad (1)$$

A student choice of option 1 implies $BB_{1d} > BB_{2d}$, however, option 1 ≠ 2. The choice of a student is denoted by the dummy variable Y, $Y = \{^{1}_{0}$ if the student chooses 1, yes or success, that is to engage in broiler value chain activities as a business after graduation and if a student choose no or failure, that is not to engage in broiler value chain activities as a business after graduation (Dadzie, 2016). This is specified as:

$$Y^* = X'_d\beta_d + e_d \quad (2)$$

Where, Y* is the unobserved random variable emanating from the differences in utility.

X = explanatory variables associated with the student making the decision.

β = unknown coefficients associated with X variables.

e = random error term. If ***e***, is standard normal distributed, then y=1 and given as $p_{rob}(y*>) = \phi(x'_d\beta_d)$ and y= 0 is given as P_{rob}(y*<0)=1-$\phi(x'_d\beta_d)$.

The likelihood function can be specified accordingly as : $Prob(y_k|x_d, \beta_d) = \phi(x'_d, \beta_d)^y(1 - \phi(x'_d, \beta_d))^{1-y}$ (3)

Therefore, the probability that a student would choose to engage in the broiler value chain is specified as;

$$BB = \phi[\beta_{0d} + \beta_1 X_{1d} + \beta_2 X_{2d} + \beta_3 X_{3d} + \beta_4 X_{4d} + \beta_5 X_{5d} + \beta_6 X_{6d} + \beta_7 X_{7d} + \beta_8 X_{8d} + \beta_9 X_{9d} + \beta_{10} X_{10d} + \beta_{11} X_{11d} + \beta_{12} X_{12d} + \beta_{13} X_{13d} + \beta_{14} X_{14d} + \beta_{15} X_{15d} + e_d] \quad (4)$$

Where X_{1d} to X_{15d} are the independent predicting variables and are further explained in Table 10. Where β_0 represents the constant term,

β_1 *to* $\beta_{15}$and e_i represent the vectors of coefficients to be predicted and error term respectively.

Table 10: Description of Variables Used in Probit Model and the Expected Signs

Independent variable	Description of variable	Apriori Exp.	Supporting literature
X_1	Sex of respondent (1=male, 2=female)	+/-	Nowiński *et al.* (2019); Wilson e*t al.* (2007) and Shinaar *et al.* (2017)
X_2	Age of respondent	+	Nxumalo and Oladele (2013), Farid et al. (2009)
X_3	Number of persons living in together as a household	+	Farid et al. (2009)
X_4	Place of residence of student (1= urban, 2 = rural)	+/-	
X_5	Place of residence of students' parents (1= urban, 2 = rural)	+/-	
X_6	If parents are farmers (dummy 1 = yes 0 = no)	+	Hallak *et al.* (2012), Ahmed et al. (2011)
X_7	If parents are poultry farmers (dummy 1 = yes 0 = no)	+	Hallak *et al.* (2012), Ahmed et al. (2011) and Díaz-Casero *et al.* (2012)
X_8	If the student engages in any economic activity (dummy 1 = yes, 0 = no)	+/-	
X_9	If student perceives the poultry industry to be lacking government support (dummy 1 = yes, 0 = no)	-	Peng *et al.* (2012) and Agbim *et al.* (2013)
X_{10}	If student perceives economic conditions not to be favorable for the poultry industry (dummy 1 = yes, 0 = no)	+/-	
X_{11}	If student perceives resource availability to be difficult for the poultry industry (dummy 1 = yes, 0 = no)	+/-	
X_{12}	If student perceives the broiler production not sociocultural sound industry to be lacking government support (dummy 1 = yes, 0 = no)	+/-	Kazeem and Asimiran, (2016), Byabashaija and Katono, (2011)
X_{13}	If student perceives the poultry production to a high-risk venture (dummy 1 = yes, 0 = no)		Peng *et al.* (2012) and Agbim *et al.* (2013)
X_{14}	If student perceives the poultry production to require high capital to start (dummy 1 = yes, 0 = no)	+/-	
X_{15}	Student's perceived knowledge level on specific value chain activity (1 = good, 0 = poor)	+	

Source: Authors Construct, (2022)

Multivariate Probit Model Estimating Drivers of Students' Choice to Engage in Specific Broiler Value Chain Activities

Individuals are assumed to know the products available to them and have an organised preference system and skills to compute the choices or courses of action available to see which one would give the highest attainable preference or utility (Simon, 1955). This sums up the theory of utility maximisation on which multivariate probit (MVP) regression modelling is premised.

MVP regression modelling is a distinctive choice model (Dadzie, 2019). An individual that makes a choice involving alternatives, let *i*, be the decision maker and *j*, the option the decision maker would choose from. A choice of the *j-th* option by the decision maker in order to maximise utility is presented according to Chib and Greenberg (1998), and Dadzie (2019) as

$$U_{ij} = u(x_{ij}, \beta_j) + e_{ij} \qquad (1)$$

Where $i = 1,\ldots\ldots\ldots, I$; $j = 1,\ldots\ldots J$,

x_{ij} = a continuous random vector (kx1), β_j = Vector of parameters or coefficients to be estimated

e_{ij} = error term that is indepently distributed

Assuming that y_{ij} represent a decision makers choice of an option j among alternatives, then y_{ij} can be defined as y_{ij} = 1 if $U_{ij} = max(U_{i1}, \ldots U_{ij})$. The y_{ij} in this study represent the decision of students to engage in multiple broiler value chain activities (Dadzie, 2019). These activities were categorized into six and include input production and distribution, broiler production, broiler processing, marketing of broilers,

waste management, and provision of support services. The choice of a specific activity is not mutually exclusive.

The decision to select a particular activity is purported to be influenced by the student's desire to maximise utility. Thus, a student will only engage in those activities that will culminate in the maximisation of utility while considering the non-exclusivity of an activity and the decision to simultaneously engage in five activities out of the six. Wu and Babcock (1998) posit that to avoid predisposition and unreliable estimate, it is imperative for any econometric modelling to determine the factors influencing participation in a specific value chain activity to clearly acknowledge the interrelation between the dependent variables (value chain activities in this case). The multivariate probit model is an econometric model that helps in addressing the issue of interrelation between the dependent variables (Ys), which is used to cooperatively determine the influence of the independent variables (Xs) on the decision to engage in a specific value chain activity. The MVP modelling for this study is drawn from Dadzie (2019) and mathematically presented as; $y_{nxp} = x_{n\times(kx1)}\beta_{(kx1)xp} + \varepsilon$ (2)

Y is defined as the $n \times p$ vectors of multiple dependent variables, X also denotes $nx(kx1)$ vector of single set of predictor variables, while β, represent the vector of unknown parameters to be estimated and, ε denotes an error term with multivariate normal distribution.

Mabe et al. (2020) used the multivariate probit regression in assessing factors influencing youth engagement in cocoa value chain activities, because the dependent variable was more than two and had interdependence (Jacques et al., 2009). As a discrete choice model, MVP is different from other

regression models due to its ability to concurrently show how several regressors affect one or more dependent variable(s) while freely allowing the correlation of the error term (Christina et al., 2013). This study adapts the MVP regression model used by Dadzie (2019) in modelling farmers decision to adopt climate smart agricultural technologies. To this end, the MVP was employed to regress the choice of students to engage in specific activities along the domestic broiler value chain against given explanatory variables. The MVP dependent variables are binary in nature (0/1) and multiple $Y_1, Y_2, \ldots . Y_j$ as observed in the data and with several latent variables $Y_1^*, Y_2^* \ldots Y_j^*$ (Dadzie, 2019).

Therefore,

$$\begin{aligned} y_1 &= \begin{cases} 1 \text{ if } y_1^* > 0 \\ 0 \text{ if otherwise} \end{cases} \\ y_2 &= \begin{cases} 1 \text{ if } y_2^* > 0 \\ 0 \text{ if otherwise} \end{cases} \\ &\vdots \\ y_j &= \begin{cases} 1 \text{ if } y_j^* > 0 \\ 0 \text{ if otherwise} \end{cases} \end{aligned} \tag{3}$$

This is further specified as:

$$\begin{cases} y_1^* = x_1\beta_1 + \varepsilon_1 \\ Y_2^* = x_2\beta_2 + \varepsilon_2 \\ \vdots \\ y_j^* = x_j\beta_j + \varepsilon_j \end{cases} \tag{4}$$

$$\Pr(y_{ij}|x_i\beta,\phi) = \int_{Aj} \ldots \int_{Aj} FN(Y_{ij}|x_i\beta,\phi)\, dy_{1,\ldots}^* \, dy_j^* \tag{5}$$

$$L(y_{ij}|x_i\beta,\phi) = \int 1y_{EA}^* \mathrm{FN}(Y_{ij}|x_i\beta,\phi)\, d_{y_j^*} \tag{6}$$

Where: $FN(Y_{ij}|x_i\beta,\phi)\,dy^*_{j...}$ is the cumulative density function MVP normal distribution and the interval A_j (0, ∞) if Yij=1 with the interval ($-\infty, 0$) when Yij=0

As stated earlier this objective of the study was to examine the drivers of youth engagement in the domestic broiler value chain by identifying the predicting factors of the choice of students to engage in a specific broiler value chain activity after graduation. The MVP is, therefore, specified as follows.

$$\begin{cases} y_1^* = \beta_{11}X_{11} + \beta_{12}X_{12} + \beta_{13}X_{13} + \beta_{14}X_{14} + \beta_{15}X_{15} + \beta_{16}X_{16} + \beta_{17}X_{17} + \ldots \beta_{115}X_{115} + \varepsilon_1 \\ y_2^* = \beta_{21}X_{21} + \beta_{22}X_{22} + \beta_{23}X_{23} + \beta_{24}X_{24} + \beta_{25}X_{25} + \beta_{26}X_{26} + \beta_{27}X_{27} \ldots \beta_{215}X_{215} + \varepsilon_2 \\ \vdots \\ y_6^* = \beta_{61}X_{61} + \beta_{62}X_{62} + \beta_{63}X_{63} + \beta_{64}X_{64} + \beta_{65}X_{65} + \beta_{66}X_{66} + \beta_{67}X_{67} + \ldots \beta_{615}X_{615} + \varepsilon_6 \end{cases} \quad (7)$$

The explanatory variables to the MVP are presented in Table 11.

Table 11: Explanatory Variables Used in Multivariate Probit Regression Model and the Expected Signs.

Dependent variable	**Description of variable**		
y_1^*	**Inputs production and distribution activities**		
y_2^*	**Broiler production activities**		
y_3^*	**Broiler processing activities**		
y_4^*	**Marketing of broiler Activities**		
y_5^*	**Waste management activities**		
y_6^*	**Provision of support services**		
Independent variable	**Description of variable**	**Apriori Exp.**	**Supporting literature**
X_1	Sex of respondent (1=male, 2=female)	+/-	Nowiński *et al.* (2019); Wilson et *al.* (2007) and Shinaar *et al.* (2017)
X_2	Age of respondent	+	Nxumalo and Oladele (2013), Farid et al. (2009)
X_3	Number of persons living in together as a household	+	Farid et al. (2009)
X_4	Place of residence of student (1= urban, 2 = rural)	+/-	
X_5	Place of residence of students' parents (1= urban, 2 = rural)	+/-	

Table 11: Continue

X_6	If parents are farmers (dummy 1 = yes 0 = no)	+	Hallak *et al*., (2012), Ahmed et al. (2011)
X_7	If parents are poultry farmers (dummy 1 = yes 0 = no)	+	Hallak *et al*. (2012), Ahmed et al. (2011) and Díaz-Casero *et al*., (2012)
X_8	If the student engages in any economic activity (dummy 1 = yes, 0 = no)	+/-	
X_9	If student perceives the poultry industry to be lacking government support (dummy 1 = yes, 0 = no)	-	Peng *et al.* (2012) and Agbim *et al.* (2013)
X_{10}	If student perceives economic conditions not to be favorable for the poultry industry (dummy 1 = yes, 0 = no)	+/-	
X_{11}	If student perceives resource availability to be difficult for the poultry industry (dummy 1 = yes, 0 = no)	+/-	
X_{12}	If student perceives the broiler production not sociocultural sound industry to be lacking government support (dummy 1 = yes, 0 = no)	+/-	Kazeem and Asimiran, (2016), Byabashaija and Katono, (2011)
X_{13}	If student perceives the poultry production to a high-risk venture (dummy 1 = yes, 0 = no)		Peng *et al.* (2012) and Agbim *et al.* (2013)
X_{14}	If student perceives the poultry production to require high capital to start (dummy 1 = yes, 0 = no)	+/-	
X_{15}	Student's perceived knowledge level on specific value chain activity (1 = good, 0 = poor)	+	

Source: Authors Construct, (2022)

CHAPTER FOUR

RESULTS AND DISCUSSION

Introduction

The purpose of this study was to analyse the current performance and challenges of the domestic broiler value chain and its implication for agricultural graduate employment in Ghana. To achieve this aim, the study mapped four nodes (feed milling, broiler production, poultry processing, and live bird selling) of the domestic broiler value chain and conducted profitability analyses on broiler production, poultry processing, and live bird selling activities of the chain in Greater Accra, Ashanti, and Bono Regions, and also measured the perceived knowledge level and perception of the youth (undergraduate final year university students) at UCC, KNUST, UENR, and AAMUSTED toward choosing broiler value chain activities as a vocation after graduation. As well as what drive their engagement and choice of activities of the broiler value chain. The results according to objectives are presented and discussed in this chapter.

Mapping of the Local Broiler Value Chain in Three Major Poultry Producing Regions of Ghana

The purpose of objective one was to map and describe the actors and their activities as well as the channels of product flow along the domestic broiler value chain in the study area. While at the same time conduct a matrix of strengths, weakness, opportunities, and threats (SWOT) analysis of the broiler value chain in the three major poultry producing regions of Ghana. To this end, the demographics, and socioeconomic characters of the four actors of the domestic broiler value chain are discussed.

Demographic and Socio-Economic Characteristics of Feed Millers

The demographic and socio-economic characteristics of feed millers in the study area are presented in Table 12 to Table 17. From Table 12 to Table 16 the figures are presented in frequencies and percentages. Whereas the presentation in Table 17 is in means and standard deviations.

Table 12: Demographic Characteristics of Feed Millers

Variables	Categories	f	%
Region	Greater Accra	13	24.1
	Ashanti	13	24.1
	Bono	28	51.9
	Total	54	100.0
Sex	Male	48	88.9
	Female	6	11.1
	Total	54	100.0
Marital Status	Single	10	18.5
	Married	42	77.8
	Widowed	2	3.7
	Total	54	100.0
Have you had any formal education	Yes	49	90.7
	No	5	9.3
	Total	54	100.0
Level of education	Basic education	9	16.7
	Secondary/ Technical or vocational	18	33.3
	Tertiary	24	44.4
	Total	51	94.4
Do you belong to a feed-millers cooperative or association	Yes	17	31.5
	No	37	68.6
	Total	54	100
Does membership help you in your feed milling business	Yes	12	22.2
	No	42	77.8
	Total	54	100
Have you received any training from the association in the past three years	Yes	12	22.2
	No	32	77.8
	Total	54	100

Source: Field survey, Tuoho (2022).

Table 13: Access to Credit and Insurance by Feed Millers

Variable	Categories	f	%
Have you ever accessed credit	Yes	16	29.6
	No	38	70.4
	Total	54	100.0
When last did you get access to credit	2021	6	11.1
	2020	1	1.9
	2019 or before	8	14.8
Has your business been insured	Yes	20	37.0
	No	34	63.0
	Total	54	100
Aspect of business insured	Building and equipment's	7	13.0
	Feed milling	9	16.7
	Saff	-	-
	All	8	11.1
	No	32	59.2
	Total	54	100.0

Source: Field survey, Tuoho (2022).

Table 14: Purpose of Feed Milling by Feed Millers

Variable	f	%
Milling for a fee (toll)	28	51.9
Milling to sell	6	11.1
Milling for a fee & selling	13	24.0
Milling for own farm use (integrated farms)	7	13.0
Total	54	100.0

Source: Field survey, Tuoho (2022).

Table 15: Types of Feed Milled by Feed Millers

Variables	Categories	F	%
Manufacture grower mash	No	8	14.8
	Yes	41	75.9
	Total	49	90.7
Manufacture chick mash	No	35	64.8
	Yes	14	25.9
	Total	49	90.7
Mill broiler starter	No	33	61.1
	Yes	16	29.6
	Total	49	90.7
Mill broiler finisher	No	8	14.8
	Yes	41	75.9
	Total	49	90.7
Mill other feed	No	42	77.8
	Yes	7	13.0
	Total	49	90.7
Specify		47	87.0
	All poultry feed	1	1.9
	All type of food	1	1.9
	Any type of feed	1	1.9
	Concentrates	1	1.9
	Horse, Pig and others	1	1.9
	Pig and Rabbit feeds	1	1.9
	Pig feed	1	1.9
	Total	54	100.0

Source: Field survey, Tuoho (2022).

Table 16: Knowledge on Regulations and Regulatory Agencies

Variables	Categories	f	%
Aware of laws/regulations governing feed milling	Yes	50	92.6
	No	4	7.4
	Total	54	100.0
Require a permit	Yes	44	81.5
	No	10	18.5
	Total	54	100.0
Regulated by EPA	No	42	77.8
	Yes	12	22.2
	Total	54	100.0
Regulated by FDA	No	42	77.8
	Yes	12	22.2
	Total	54	100.0
Regulated by GSA	No	44	81.5
	Yes	10	18.5
	Total	54	100.0
Regulated by VSD	No	39	72.2
	Yes	15	27.8
	Total	54	100.0
Regulated by APD	No	41	75.9
	Yes	13	24.1
	Total	54	100.0
Regulated by Feed Millers Asso.	No	47	87.0
	Yes	7	13.0
	Total	54	100.0
Regulated by DA	No	4	7.4
	Yes	50	92.6
	Total	54	100.0
Regulated by EHD	No	46	85.2
	Yes	8	14.8
	Total	54	100.0
Service delivery	Poor	5	8.7
	Good	20	37.0
	Very Good	28	51.9
	Excellent	1	1.9
	Total	49	90.7
Cost of service	Low	5	9.3
	Moderate	43	79.6
	High	5	9.3
	Very high	1	1.9
	Total	54	100.0

Source: Field survey, Tuoho (2022).

Table 17: Socio-Economic Characteristics of Feed Millers

	n	Minimum	Maximum	Mean	Std. Deviation
Age of feed miller owner	50	30	80	52.02	9.321
Number of metric tonnes(mt) mill per week by toll feed mills	38	.50	60.00	10.8026	9.68667
Number of metric tonnes(mt) are mill per month by toll feed mills	22	3	360	69.50	77.413
Number of metric tonnes(mt) are mill per year by toll feed mills	12	12	1300	319.50	355.079
Fee charged per metric tonn of feed milled	31	2.50	2500.00	123.3065	441.43015
Total operational (potential) capacity of feed mills (Mt)	52	1.00	250.00	10.6442	34.33148
Current production capacity of feed mills (Mt)	51	1.00	150.00	7.0784	20.64276
Total production per cycle (tonnage) by commercial feed mills	16	1.50	420.00	66.7188	136.49322
Total number of workers	52	1	20	5.12	3.776
Number of male workers	52	1	20	4.67	3.552
Number of female workers	48	0	3	.50	.923
Number of workers under 36 years	49	0	12	3.31	2.493

Source: Field survey, Tuoho (2022)

The results in Table 12 show that among the 54 respondents, 88.9% were males with only 11.1% being females and 77.8% married. The average age of the owners of feed mills in the study area was 52.02 years (see Table 17). However, Mensah-Bonsu et al. (2019) reported that feed milling activity in Ghana was dominated by males as much as 97.3% while 2.7% of the actors involved were females. On the contrary, in Nigeria's poultry feed marketing chain, a mean age of 46 years was reported for actors with 57.3% involvement of males and 42.7% of females (Gbigbi & Chuks-Okonta, 2020).

A total of 90.7% of the respondents had formal education, of these 44.4% were graduates of tertiary institutions whiles 16.7% were from the basic level of education, and 33.3% completed secondary/ technical or

vocational institutions. The results in Table 12 also reveal that only 31.5% (17) of feed millers belong to a Feed-Millers Cooperative or Association out of which 12 of them indicated that their membership in the association was helpful to their feed milling business, noting that they had received some training over the period of their membership from the association.

Feed milling business is a capital-intensive activity in the poultry industry as such access to capital and insurance are critical inputs. In this regard, the study found varying responses from feed millers on their access to credit and insurance, the results are presented in Table 13. The results reveal that only 29.6% of the 54 feed millers indicated that they have received credit in the last four to five years while 37% said they have insured some aspects of their feed milling business. The aspects of their businesses that have been insured include building and equipment (7), feed milling (9), and all aspects of the business (8). This finding concurs with the assertion of Mensah-Bonsu et al. (2019) that access to credit is generally difficult for poultry value chain actors in Ghana.

Feed milling is undertaken for different purposes, for integrated poultry producers it may be to feed their birds, while for the toll feed miller it is a business to mill the feed ingredients poultry producers bring to them for a fee. Similarly, the local commercial feed miller manufactures blended or branded feed for producers, indeed some do both or all these that have been described. The purposes for which feed millers undertake their activities are presented in Table 14.

Table 14 results show that 51.9% of the 54 respondents were milling for a fee (toll), 11.1% were local commercial feed mills producing blended

feed to sell, whereas 24.0% were milling for a fee and to sell as well. It was also found that among these feed millers 13% of them were integrated poultry farms that have feed mills that are used to mill feed for their birds only. This finding is in synch with what has been reported by Andam et al. (2017) in their description of feed milling activities in Ghana. For the commercial feed mills producing blended feed to sell, the types of feed milled by them (see details in Table 15) include chick mash, broiler starter, grower mash, and broiler finisher among others.

As presented in Table 17, the socio-economic characteristics of feed millers show that toll feed millers can mill an average of 10.80 metric tonnes (Mt) of feed per week at an average charge/fee of GH¢123.30 per tonne. According to respondents, the average operational (potential) capacity of their feed mills was 10.64(Mt) but they were all operating at an average capacity of 7.07 Mt at the time of the interview. However, the total production per cycle (tonnage) for commercial feed mills on average was 66.72 Mt. Earlier studies have confirmed that most feed mills in the country were operating below capacity (Andam et al., 2017).

On average, the results in Table 17 reveal that the number of people employed by a feed mill was 5.12 in the study area. The gender segregation shows that 4.67 were males and 3.31 of these employees were found to be below the age of 36 years.

As a value chain study, there was the need to find out how feed mill operators were working within the laws and regulations of government spearheaded by key government ministries and agencies as well as decentralised departments. These agencies also serve as institutions that

provide support services and regulation to the feed milling industry. It, therefore, requires that actors have knowledge of these regulations and the regulatory bodies or agencies. Table 16 presents the results of feed millers' knowledge of regulations and regulatory agencies and their working relationship with these agencies in the industry.

The results in Table 16, show that 92.6% of the 54 respondents were aware of laws or regulations governing feed milling in Ghana. Similarly, 77.8% of the feed millers had no approval or permit from the Environmental Protection Agency (EPA), Food and Drugs Authority (FDA) to operate a feed mill, in the case of Ghana Standards Authority (GSA) the number of feed millers who had no permit was 44 (81.5%). However, 27.8% of feed millers said they have the approval or permit from the VSD to operate their feed mills while only 24.1% indicated to have the approval or permit from APD. Interestingly about 92.6% of the feed millers said they have a permit from their respective District Assemblies to operate their businesses.

On how feed millers perceived the quality of the services these institutions provide to support their feed milling business, majority rated the quality of service as good (37.0%) and (51.9%) very good respectively.

Demographic and Socio-Economic Characteristics of Broiler Producers

The demographic and socio-economic characteristics of broiler producers in the study area are presented in Table 18 to Table 23. Whereas figures in Table 18 to Table 22 are presented in frequencies and percentages. However, the presentation in Table 23 is in means and standard deviations.

Table 18: Demographic characteristics of broiler producers

Variable	Categories	f	%
Region	Ashanti	105	37.0
	Bono	39	13.7
	Greater Accra	140	49.3
	Total	284	100.0
Sex	Male	232	82.02
	Female	52	17.98
	Total	284	100.0
Marital status	Single	38	13.4
	Married	232	81.7
	Divorced	6	2.1
	Widowed	8	2.8
	Total	284	100.0
Have you had any formal education	Yes	259	91.2
	No	23	8.1
	Total	284	100.0
Level of education	Basic education	77	25.4
	Secondary/Technical or Vocational	73	25.7
	Tertiary	139	48.9
	Total	284	100.0
Other occupation	I don't have any other occupation	104	36.6
	Public or Civil servant	45	15.8
	Private sector employee	76	26.8
	Other	59	20.8
	Total	284	100.0
Do you belong to any poultry cooperative/association	Yes	143	50.4
	No	141	49.7
	Total	284	100.0
Does the membership help you in your poultry production business	Yes	133	46.8
	No	151	53.2
	Total	284	100.0
Have you received any training from the association in the past three years	Yes	142	50.0
	No	142	50.0
	Total	284	100.0
	Type of production system		
What type of production phase are you practicing in your farm	Starter phase	2	0.7
	Finisher phase	9	3.2
	Starter to finisher phase	273	96.1
	Total	284	100.0
	Source of labour		
Do you use family labour on the farm	No	185	65.1
	Yes	99	34.9
	Total	284	100.0
Do you have access to extension services	Yes	248	87.3
	No	36	12.7
	Total	284	100.0
	Total	284	100.0

Source: Field survey, Tuoho (2022).

Table 19: Access to Credit and Insurance by Broiler Producers

Variable	Categories	f	%
Have you ever accessed credit	Yes	63	22.3
	No	221	77.7
	Total	284	100.0
When last did you get access to credit	2021	15	5.3
	2020	11	3.9
	2019 or before	31	10.9
Source of credit	Banks/Savings and Loans/Microfinance/Credit union	38	13.4
	Relatives	17	6.0
	Colleague's poultry Farmers/friends	4	1.4
	NGOs	1	0.4
	Agro-inputs dealers	1	0.4
	Poultry out-grower	2	0.7
	Total	284	100.0
Has your business been insured	Yes	14	4.9
	No	270	95.1
	Total	284	100.0
Aspect of business insured	Building and equipment's	8	2.8
	Birds(broilers)	2	0.7
	Staff	1	0.4
	All	4	1.4
	No	269	94.7
	Total	284	100.0

Source: Field survey, Tuoho (2022).

Table 20: Input Supply to Broiler Producers

Variables	Categories	f	%
	Source of Feed		
Own formulation	No	127	44.7
	Yes	157	55.3
	Total	284	100.0
Local feed mills	No	93	32.7
	Yes	191	67.3
	Total	284	100.0
Imported feed	No	184	64.8
	Yes	100	35.2
	Total	283	99.6
	Total	284	100.0
Others	No	281	99.0
	Yes	3	1.0
	Total	284	100.0
	Source of Day-Old Chicks		
Local hatcheries	No	159	56.0
	Yes	125	44.0
	Total	284	100.0
Imported DOCs	No	91	32.0
	Yes	193	68.0
	Total	284	100.0
Own hatchery	No	279	98.2
	Yes	5	1.8
	Total	284	100.0
	Source of Vaccines & medications		
Government veterinary service	No	108	38.0
	Yes	176	62.0
	Total	284	100.0
Private veterinary service	No	151	53.2
	Yes	133	46.8
	Total	284	100.0
NGOs providing veterinary services	No	277	97.5
Others	Yes	7	2.5
	Total	284	100.0
	Source of equipment		
Importers of poultry production equipment	No	137	48.2
	Yes	147	51.8
	Total	284	100.0
Local producers of poultry production equipment	No	65	22.9
	Yes	219	77.1
	Total	284	100.0
Used equipment	No	275	96.8
	Yes	9	3.2
	Total	284	100.0

Source: Field survey, Tuoho (2022).

Table 21: Broiler Producer's Knowledge of Regulations and Regulatory Agencies

Variables	Categories	f	%
Aware of laws/regulations governing broilers	Yes	180	63.4
	No	104	36.6
	Total	284	100.0
Permit for operations by government agency or professional associations	Yes	153	53.9
	No	131	46.1
	Total	284	100.0
Is broiler farm regulated by EPA	No	235	82.7
	Yes	49	17.3
	Total	284	100.0
Is broiler farm regulated by FDA	No	249	87.7
	Yes	35	12.3
	Total	284	100.0
Is broiler farm regulated by GSA	No	269	94.7
	Yes	15	5.3
	Total	284	100.0
Is broiler farm regulated by VSD	No	158	55.6
	Yes	126	44.4
	Total	284	100.0
Is broiler farm regulated by APD	No	220	77.5
	Yes	64	22.5
	Total	284	100.0
Is broiler farm regulated by Ghana National Association of Poultry farmers	No	233	82.0
	Yes	51	18.0
	Total	284	100.0
Is broiler farm regulated by DA	No	84	29.6
	Yes	200	70.4
	Total	284	100.0
Is broiler farm regulated by EHD	No	230	81.0
	Yes	54	19.0
	Total	284	100.0
Service delivery	Poor	59	20.8
	Good	134	47.2
	Very good	84	29.6
	Excellent	7	2.5
	Total	284	100.0
Cost of service delivery	Low	75	26.0
	Moderate	141	49.6
	High	61	21.5
	Very high	7	2.5
	Total	284	100.0

Source: Field survey, Tuoho (2022).

Table 22: Choice of Marketing Outlets for Birds and Contractual Agreement to Supply Broilers

Variable	Categories	f	%
	Form of sale of broiler birds		
Live bird			
	No	68	23.5
	Yes	221	76.5
	Total	289	100
Whole dressed chicken	No	208	72
	Yes	81	28
	Total	289	100
Chicken-cuts/ parts	No	285	98.6
	Yes	4	1.4
	Total	289	100
	Choice of marketing outlets for live birds		
Directly to consumers	No	49	17
	Yes	240	83
	Total	289	100
	No	93	32.2
Retailers	Yes	196	67.8
	Total	289	100
Wholesalers	No	176	60.9
	Yes	113	39.1
	Total	289	100
	No	257	88.9
Institutions	Yes	32	11.1
	Total	289	100
	No	225	77.8
Chop bars	Yes	64	22.2
	Total	289	100.0
	No	254	87.9
	Yes	35	12.1
Processors	Total	289	100
	No	246	85.1
	Yes	43	14.9
Hawkers	Total	289	100
	No	286	99
	Yes	3	1
	Total	289	100
Others			
Contractual agreement to supply broilers			
Producing under any contractual agreement	No	199	68.8
	Yes	90	31.2
	Total	289	100.0

Source: Field survey, Tuoho (2022).

Table 23: Socio-Economic Characteristics of Broiler Producers

	n	Minimum	Maximum	Mean	Std. Deviation
Age of farm owner	262	20	80	48.15	11.747
Number of dependents	278	0	18	5.23	2.794
Number of poultry farms own	257	1	4	1.10	.392
Total bird capacity of farm per production cycle	280	100	41000	2356.14	4084.654
Number of farm workers	268	0	65	2.91	4.361
Number of male workers	270	0	57	2.17	3.751
Number of female workers	270	0	8	.62	1.055
Farm workers under 36 years of age	269	0	20	1.55	2.032
Number of farm workers in the broiler section	270	0	10	2.03	1.334
Quantity of land (site of operation)	190	.30	40.00	3.9226	5.32169
Total number of DOC used during the last production cycle	284	80	5000	644.16	705.338
Unit price of DOC used during the last production cycle	282	4.50	13.00	8.3805	1.86927
Mortality of DOC used during the last production cycle	270	.00	500.00	29.9184	54.07062
Number of birds raised for sale during the last production cycle	278	50	5000	642.21	715.038
Average mortality	262	.00	500.00	29.3096	48.04279
Number of birds sold	276	10	9970	620.90	871.274
Average price per bird GH¢	278	22.00	100.00	60.7212	12.62177

Source: Field survey, Tuoho (2022).

The demographic characteristics of broiler producers in Table 18 reveal that 82.02% of the 284 producers were males. This implies that broiler production in the study area was male dominated. This has implications for the

profit efficiency of broiler farms in the study area. In an earlier study, Amanor-Boadu et al. (2016) reported the involvement of males in poultry production to constitute 87.8%. Similarly, Yevu and Onumah (2021) reported 84% of male involvement in layer production. The producers that were married constitute 81.7% of the study population. It was also found that about 91.2% of the broiler producers in the study area were formally educated with 48.9% having received tertiary education. Formal education would impact on how producers adopt innovations such as best practices in feeding and biosecurity enforcement on farms. Similarly, Amanor-Boadu et al. (2016) reported that the formal education rate among Ghana's poultry producers was 96.6% and above the national population average on educated people in Ghana.

There was a split on the membership of broiler producers to Poultry Farmers Association or Cooperative. Those producers who belonged to an association was 143 while those who did not was 141. This is in contrast to what has been reported among layer producers in Greater Accra and Brong-Ahafo region by Yevu and Onumah (2021) who found 70% of the producers to be members of a farmer based organization. The majority (96.1%) of the broiler producers raise the broiler from the start to the finishing phase. The remainder only does the starting phase (0.7%) or the finisher phase (3.2%). This results show a changing approach of some producers, on how they enter and participate in the production aspect of the broiler value chain to maximise their utility.

In Table 23, the socioeconomic characteristics of the producers reveal that the mean (average) age of a broiler producer in the study area was 48.15

years with an average household size of 5.23. The implication of this on profit efficiency is enormous. This finding disagrees with what has been reported in earlier studies, that the average age among broiler farmers in Greater Accra was 42.56 years (Dziwornu & Sarpong, 2014). The average capacity of a broiler farm in the study area per production cycle was 2,356.14 birds. However, the farms studied were producing below capacity with an average of 644.16 birds per production cycle. The implication of the average bird population per farm is that, though they are commercial farms, they could be classified as small scale since their bird population is less than 1,000 birds' (Aning et al., 2008).

Averagely, producers in the study area bought a DOC at GH¢ 8.38 and recorded an average mortality rate of 29.91 (4.6%) birds per production cycle and sold a live bird at an amount of GH¢ 60.72. On the contrary, Dziwornu and Sarpong (2014) found the average cost of broiler DOC as GH¢ 2.07 and mature broiler as GH¢ 16.40 and Yevu and Onumah (2021) reported a mortality rate of 6.58% in layers.

A typical broiler farm in the study area averagely employs 2.91 workers. The majority (2.17) of the employees were males whose (1.55) ages were below 36 years. According to Amanor-Boadu et al. (2016) an average of 79.9% of broiler farms in Ghana has paid or unpaid employees. While an average of 3 of the employees are males and 2.6 are female.

Access to credit and insurance by broiler producers is presented in Table 19, the results show that only 22.3% (63 producers) of the 284 respondents had credit in the last four to five years. Among the 68 producers, 38 got their credit from either of the following financial institutions

(Banks/Savings and Loans/Microfinance/Credit union) while 17 had theirs from relatives, 4 from colleague poultry farmers, and 1 from an NGO. The rest were agro-inputs dealers 1, and poultry out-grower 2. The findings are consistent with existing literature that reported that few poultry farmers get access to credit from financial institutions and that most farmers self-finance or get their funding from relatives (Adei & Asante, 2012; McLeod et al., 2009; Mensah-Bonsu et al. ,2019).

On insurance policies for broiler-producing businesses, only 4.9% had insured different aspects of their broiler businesses with 0.7% of the respondents indicating that they have insured their broiler birds.

Input supply to broiler-producing businesses as captured in appendix P show that 157 broiler producers out of the 284 respondents formulated their own feed whiles 127 sourced their feed from local toll and commercial feed mills as well as imported sources. However, 125 (44.0%) broiler producers sourced their DOCs from local hatcheries whiles 193 from imported sources. Broiler producers get most of their veterinary services and medication from government veterinary services (62%) and the rest from private and individual sources. These findings on the sources and supply of production inputs are consistent with what has been reported by Mensah-Bonsu et al. (2019). The majority (51.8%) of equipment used to produce broilers in Ghana is imported while the others procured theirs from local fabricators or producers.

Broiler producers work within the confines of laws and regulations of the central government spearheaded by key government ministries and agencies as well as decentralised departments. These agencies also serve as institutions that provide support services and regulation to the broiler value

chain. Hence knowledge of these regulations and the regulatory bodies or agencies is critical for the growth of the domestic broiler value chain. Table 21 presents the results of broiler producers' knowledge on regulations and regulatory agencies and their working relationship with these agencies in the industry.

The results reveal that 63.4% of broiler producers in the study area are aware of existing laws or regulations governing broiler production in Ghana. On the working relationship with these bodies or government agencies mandated to enforce these regulations or laws. Broiler producers indicated their engagement with these agencies as follows; about 53.9% of producers indicated to have worked with these government agencies or professional associations to acquire permits for their operations. However, only 17.3% of the producers confirm having an operational permit from the EPA, while 12.3% have an FDA permit and 5.3% were regulated by the GSA.

The rest are VSD which had the second highest with 44.4% of producers having approval or a working relationship with the directorate. Indeed, the Ghana Statistical Service (2019b) reported that 74% of respondents in their survey reported difficulties in getting veterinary services. Only 22.5% of the broiler producers had approval or a working relationship with APD and 19.0% for the Environment Health Directorate (EHD), while 70.4% of broiler producers had permits from their respective District Assemblies (DA) to operate, the highest among the agencies.

Broiler producers rated the quality-of-service delivery by these agencies as follows; poor (20.8%), good (47.2%), very good (29.6%), and excellent (2.5%). On the cost of services delivered to broiler producers by

these government agencies, producers rated their fees as; low (26.0 %), moderate (49.6 %), high (21.5 %), and very high (2.5 %).

Marketing is critical for broiler producers in Ghana, for this reason, the choice of marketing outlets for birds and whether producers are under contractual agreement to produce and supply or not is critical. Therefore, Table 22 present the choice of marketing outlets for birds and broiler producers who are under contractual agreement to produce and supply. The results in Table 22 reveal that 76.5% of the 284 respondents sell their birds as live birds. While the remainder (28%) dressed the birds to sell as whole birds. According to the results 83% of the live birds are sold directly to consumers and the rest to retailers, wholesalers, and institutions, chop bars, processors, and hawkers. These findings agree with what has been reported by Amanor-Boadu et al. (2016) and Mensah-Bonsu et al. (2019) that broiler farmers in Ghana sell live birds to consumers, who may include direct-to-consumer, hotels, restaurants, and institutions etc.

Respondents who had contractual agreement to supply broilers were 31.1% of the 284 respondents. This confirms reports by earlier studies that some broiler producers in Ghana are contract growers who produce for an integrator (Aning et al., 2008; Mensah-Bonsu et al., 2019).

Demographic and Socio-Economic Characteristics of Live Bird Sellers

The live birds' sellers in the study area demographic and socioeconomic characteristics are presented in Table 24 to Table 28. The figures in Table 24 to Table 27 are presented in frequencies and percentages. Whereas in Table 28, the presentation is in means and standard deviations.

Table 24: Demographic Characteristics of Live Bird Sellers

Variables	Categories	f	%
Region	Greater Accra	36	34.0
	Bono	18	17.0
	Ashanti	52	49.1
	Total	106	100.0
Sex	Male	40	37.7
	Female	66	62.3
	Total	106	100.0
Marital status	Single	21	19.8
	Married	70	66.0
	Divorced	4	3.8
	Widowed	7	6.6
	Co-habitation	4	3.8
	Total	106	100.0
Formal education	Yes	91	85.8
	No	15	14.2
	Total	106	100.0
Level of education	Basic education	53	50.0
	Secondary/ Technical or vocational	35	33.0
	Tertiary	18	17.0
	Total	106	100.0
Other occupation apart from the marketing of live birds	I do not have any other occupation	59	55.6
	Public or civil servant	5	4.7
	Private sector employee	15	14.2
	Others	27	25.5
	Total	106	100.0
Do you belong to any live bird's sellers/traders/marketers association	Yes	47	44.3
	No	59	55.6
	Total	106	100.0
Do association help you in selling live birds	Yes	38	35.8
	No	68	64.2
	Total	106	100.0
Training from association	Yes	32	30.2
	No	64	69.8
	Total	106	100.0

Source: Field survey, Tuoho (2022)

Table 25: Access to Credit and Insurance by Live Bird Sellers

Variables	Categories	f	%
Credit access	Yes	29	27.4
	No	77	72.6
	Total	106	100.0
Last credit access	2021	11	10.4
	2020	4	3.8
	2019 or before	10	9.4
	Total	25	23.6
	No	81	76.4
	Total	106	100.0
Means of credit repayment	Cash	29	27.4
	In-kind	2	1.9
	Total	31	29.2
	No	75	70.8
	Total	106	100.0
Source of credit cash	Banks/ Savings and Loans/ Microfinance/ Credit unions	26	24.5
	Relatives	2	1.9
	Colleagues live bird seller/ friends	1	0.9
		-	-
	Total	29	27.4
	No	77	72.6
	Total	106	100.0
Have you insured the business	Yes	7	6.6
	No	99	93.4
	Total	106	100.0
Aspect of building insured	Building and equipment's	1	0.9
	Live birds for sale	5	4.7
	Total	6	5.7
	No	100	94.3
	Total	106	100.0

Source: Field survey, Tuoho (2022).

Table 26: Marketing Channels and Types of Poultry Marketed by Live Bird Sellers

Variables	Categories	f	%
Source of live birds	Own farm	8	7.5
	Poultry farmers/producers located around	62	58.5
	Other District in this region	27	25.5
	Other regions	3	2.8
	Others	6	5.6
	Total	106	100.0
Market broilers	No	16	15.1
	Yes	90	84.9
	Total	106	100.0
Market spent layers	No	14	13.2
	Yes	92	86.8
	Total	106	100.0
Market cockerels	No	35	33.0
	Yes	71	67.0
	Total	106	100.0
Market local birds	No	58	54.7
	Yes	48	45.3
	Total	106	100.0
Market other birds	Yes	102	96.2
	No	1	0.9
	Guinea fowl	3	2.8
	Total	106	100.0

Source: Field survey, Tuoho (2022).

Table 27: Knowledge on Regulations and Regulatory Agency by Live Bird Sellers

Variables	Categories	f	%
Do you have a permit	Yes	63	59.43
	No	43	40.57
	Total	106	100.0
Regulated by the EPA	No	98	92.5
	Yes	8	7.5
	Total	106	100.0
Regulated by FDA	No	99	93.4
	Yes	7	6.6
	Total	106	100.0
Regulated by GSA	No	102	96.23
	Yes	4	3.77
	Total	106	100.0
Regulated by VSD	No	71	67.0
	Yes	35	33.0
	Total	106	100.0
Regulated by APD	No	92	86.8
	Yes	14	13.2
	Total	105	99.1
Regulated by live bird sellers association	No	81	76.4
	Yes	25	23.6
	Total	106	100.0
Regulated by District Assembly	No	50	47.2
	Yes	56	52.8
	Total	105	99.1
Regulated by Environmental Health Department	No	84	79.2
	Yes	22	20.8
	Total	106	100.0
Service delivery	Poor	44	41.5
	Good	25	23.6
	Very Good	28	26.4
	Excellent	9	8.5
	Total	106	100.0
Cost of service delivery	Low	10	9.4
	Moderate	40	37.7
	High	7	6.6
	Very high	49	46.2
	Total	106	100.0

Source: Field survey, Tuoho (2022).

Table 28: Socio-Economic Characteristics of Live Bird Sellers

	n	Minimum	Maximum	Mean	Std. Deviation
Age of marketing/ trade business owner	103	24	75	44.89	10.709
Total capacity (potential) or number of live birds' facility can take	102	20	6000	371.27	791.444
Current number of live birds in the facility	101	0	500	42.14	71.088
Number of markets operated in	103	1	4	1.25	.682
Total number of workers	63	0	15	2.25	2.199
Number of male workers	59	0	13	1.49	2.153
Number of female workers	56	0	3	.91	.880
Number of workers under 36 years	30	0	6	2.03	1.691
Selling price of birds (GH¢)	103	60	90	77.52	6.747
Number of birds sold per day	78	1	200	19.14	27.295

Source: Field survey, Tuoho (2022).

The results in Table 24 reveal that the majority (62.3%) of the 106 live bird sellers were females while males were the minority (37.7%). This would have an implication on the profit efficiency of the live bird sellers. This finding agrees with what has been reported by Mensah-Bonsu et al. (2019) that among actors of the broiler and layer value chains in the Bono region of Ghana, trade and marketing activities of the chain were dominated by females as high as 77.5% while only 22.5% were males.

Among these respondents, 66.0% were married and 85.8% had formal education. The highest level of education obtained by a respondent was tertiary, of which 17% of them had attained. However, the highest level of education for most (50.0%) of these live bird sellers was basic education followed by secondary and technical or vocational (33%). However, Ayieko et al. (2014) reported a 100% educational level of live bird traders studied in

Kenya, out of which 56% attained secondary education and 12% tertiary education and the remaining 32% primary (basic) education.

These live bird sellers mostly (55.6%) did not belong to an association only 44.3% were members of the live bird seller's association. The mean (average) age of a live bird seller in the study area as presented in Table 28 on socio-economic characteristics of live bird sellers was 44.89 years. Age is critical determinant of profit efficiency in most broiler value chain activities. This finding contradicts Ayieko et al. (2014) who reported a mean age of 36 years among indigenous chicken live birds' sellers in Kenya.

On average a live bird seller in the study area has the capacity to hold and sell 371.27 birds per day but at the time of the study, they were holding 42.14 birds and selling 19.14 birds per day at an average price of GH¢ 77.52. However, in an earlier study by Amanor-Boadu et al. (2016) reported an average price of GH¢ 36.94 per bird via the direct-to-consumer channel. A typical live bird business in the study area engages the services of 2.25 people on average and 2.03 of the workers were under 36 years old and the majority (1.49) were males.

Table 25 presents the results of live bird sellers' access to credit and insurance. The results reveal that only 27.4% of the 106 live bird sellers that participated in the study had access to credit in the last four to five years. The sources of the credit ranged from banks/ savings and loans/ microfinance/ credit unions (26 respondents) to relatives (2 respondents) and colleagues or friends of live bird sellers (1 respondent). This disagrees with the findings of Mensah-Bonsu et al. (2019) who reported that 15% of actors in the broiler and layer value chains in the Brong-Ahafo Region engaged in trading and

marketing activities on the chain had access to credit from banks and microfinance institutions.

It is also interesting to note that the results in appendix U, show that 6.6% of the live bird sellers indicated that they have insured some aspects of their business, ranging from building and equipment (1 live bird seller) to the live bird selling business itself (6 respondents).

The study also identified the marketing channels and types of poultry marketed by live bird sellers and the results are presented in Table 26. Table 26 results reveal that 58.5% of the live bird sellers get their supply of birds for their business from poultry farmers or producers located around them in the same district, while 25.5% of their supplies come from other districts in the same region. Among the type of poultry marketed by the respondents, 84.9% indicated that they sell broilers whiles 86.8% also said they sell spent layers, and 67.0% also market cockerels in addition. The rest are local birds which 45.3% of the live sellers indicated they also trade in.

The study identified the laws and regulations of the government within which live bird sellers operated and the institutions of state that provide support services and regulation to their activities. In lieu of this, live bird sellers need to have knowledge of these regulations and the regulatory bodies or agencies. Since it is critical for the growth of the live bird selling business. Table 27 presents the results of live bird sellers' knowledge of the regulations and regulatory agencies and their working relationship with these agencies in the industry. The results in Table 27, reveal that 59.43% of respondents indicated that they have obtained a permit from the state agencies to operate their live bird-selling business.

Live bird sellers' engagements with specific state institutions are as follows; as per Table 27, 92.5% of the live bird sellers said they have not obtained a permit from the EPA for their businesses whereas 7.5% said they have an EPA permit to operate their businesses. Similarly, 93.4% said they have no FDA related approval for their businesses whiles 6.6% of the respondents said they have FDA approval to operate their businesses. Only 3.77% indicated having a relationship or approval from GSA for their businesses. However, the majority (67.0%) of respondents indicated having approval from the VSD for the operations of their live bird selling business. This may be due to issues of Zoonosis, bird flu and other disease outbreaks which necessitate animal health care providers to have establish presence in these live bird markets (Aning et al., 2008). While 52.8% indicated that they have approval from their respective District Assemblies to operate their business.

On the quality of service provided to them by the government agencies, the majority (41.5%) of respondents rated it as poor and 26.4% said it was very good. The rest are good (23.6%) and excellent (8.5 %). The cost-of-service delivery to respondents was rated very high by the majority (46.2 %) of live bird sellers. Whiles 9.4% considered the cost to be low, 37.7% said it was moderate and 6.6% indicated that it was high.

Demographic and Socio-Economic Characteristics of Poultry Processors

Poultry processors' demographic and socioeconomic characteristics in the three study regions are presented in Table 29 to Table 33. The presentation in Table 29 to Table 32 are in frequencies and percentages. While that of Table 33 is in means and standard deviations.

Table 29: Demographic Characteristics of Poultry Processors

Variables	Categories	f	%
Region	Ashanti	5	17.9
	Greater Accra	21	75.0
	Bono	2	7.1
	Total	28	100.0
Sex	Female	9	32.1
	Male	19	67.9
	Total	28	100.0
Marital status	Single	1	3.6
	Married	23	82.1
	Divorced	2	7.1
	Widowed	2	7.1
	Total	28	100.0
Formal Education	Yes	27	96.4
	No	1	3.6
	Total	28	100.0
Level of education	Basic education	5	18.5
	Secondary/ Technical or vocational	4	14.8
	Tertiary	18	66.7
	Total	27	100.0
Other business	I don't have any other occupation	8	28.6
	Public or Civil servant	3	10.7
	private sector employee	10	35.7
	Other	7	25.0
	Total	28	100.0
Membership of poultry processors association	Yes	11	39.3
	No	17	60.7
	Total	28	100.0
Do you get help from the association	Yes	8	28.6
	No	20	71.4
	Total	28	100.0
Any training from association in the past 3 years	Yes	9	32.1
	No	19	67.9
	Total	28	100.0
Type of ownership of site	Sole own site	15	53.6
	Family own site	6	21.4
	Rented site	3	10.7
	Own by the District assembly	3	10.7
	Other	1	3.6
	Total	28	100.0
Meat only processing line	No	6	21.4
	Yes	22	78.6
	Total	28	100.0
Egg only processing line	No	22	78.6
	Yes	6	21.4
	Total	28	100.0
Both meat and egg processing line	No	22	78.6
	Yes	6	21.4
	Total	28	100.0
Other processing line	No	28	100.0

Source: Field survey, Tuoho (2022).

Table 30: Access to Credit and Insurance by Poultry Processors

Variables	Categories	f	%
Access to credit	Yes	13	46.4
	No	15	53.6
	Total	28	100.0
Last time credit was accessed	2021	4	14.3
	2020	1	3.6
	2019 or before	8	28.6
	No	15	53.6
	Total	28	100.0
Source of credit	Banks/ Savings and Loans/ Microfinance/ Credit union	10	35.7
	Relatives	3	10.7
	Total	13	46.4
	No	15	53.6
	Total	28	100.0
Has your business been insured	Yes	5	17.9
	No	23	82.1
	Total	28	100
Aspect of business ensured	Building and equipment's	1	3.6
	processing of birds	2	7.1
	Total	3	10.7
	No	25	89.3
	Total	28	100.0

Source: Field survey, Tuoho (2022).

Table 31: Poultry Processor's Knowledge of Regulations and Regulatory Agencies

Variables	Categories	f	%
Awareness of laws/regulations	Yes	17	60.7
	No	11	39.3
	Total	28	100.0
Do you have permit	Yes	17	60.7
	No	11	39.3
	Total	28	100.0
Regulated by EPA	No	15	53.6
	Yes	13	46.4
	Total	28	100.0
Regulated by FDA	No	19	67.9
	Yes	9	32.1
	Total	28	100.0
Regulated by GSA	No	23	82.1
	Yes	5	17.9
	Total	28	100.0
Regulated by VSD	No	13	46.4
	Yes	15	53.6
	Total	28	100.0
Regulated by APD	No	23	82.1
	Yes	5	17.9
	Total	28	100.0
Regulated by Poultry Processors Assoc.	No	27	96.4
	Yes	1	3.6
	Total	28	100.0
Regulated by DA	No	6	21.4
	Yes	22	78.6
	Total	28	100.0
Regulated by EHD	No	20	71.4
	Yes	8	28.6
	Total	28	100.0
Service delivery, if you got permit	Poor	5	17.9
	Good	19	67.9
	Very Good	3	10.7
	Excellent	1	3.6
	Total	28	100.0
Cost of service	Low	10	35.4
	Moderate	15	53.6
	High	3	10.7
	Total	28	100.0

Source: Field survey, Tuoho (2022).

Table 32: Production, Marketing and Price Setting by Poultry Processors

Variables	Categories	f	%
Agreement with other businesses or persons to supply product	Yes	21	75.0
	No	7	25.0
	Total	28	100.0
What type of agreement?	Verbal/ word of mouth	14	50.0
	Written agreement	8	28.6
	No	6	21.4
	Total	28	100.0
Processing birds for a fee	Yes	18	64.3
	No	10	35.7
	Total	28	100.0
Is there a ready market for the products (dressed chicken/chicken cut)?	Yes	21	75.0
	No	7	25.0
	Total	27	96.4
	Total	28	100.0
	Total	28	100.0
Do you consider access to market before processing birds?	Yes	23	82.1
	No	5	17.9
	Total	28	100.0

Source: Field survey, Tuoho (2022).

Table 33: Socio-Economic Characteristics of Poultry Processors

	n	Minimum	Maximum	Mean	Std. Deviation
Age of processing business owner	23	30	70	47.13	10.359
Number of dependents (household size)	24	2	20	6.50	4.283
Total number of workers	24	0	55	7.42	12.642
Number of male workers	23	0	34	5.04	8.210
Number of female workers	22	0	30	2.91	6.361
Number of workers under 36 years	16	0	9	3.31	2.845
Number of workers working in the poultry processing plant/ facility	24	1	55	7.33	12.534

Source: Field survey, Tuoho (2022).

The results in Table 29, reveal that the majority (67.9 %) of the 28 poultry processors were males and those who were married constituted 82.1%. This finding disagrees with an earlier study by Mensah-Bonsu et al. (2019)

that found 100% of the actors that were dressing birds to be males. The mean age of a processor was 47.13 years who hail from a household with an average of 6.50 people (see Table 33). Table 29 results also reveal that 96.4% of respondents had formal education of which the majority (66.7%) attained tertiary level while the minority (14.8 %) attained the level of secondary/ technical or vocational education. Among the poultry processors, only 11 (39.3%) belong to a poultry processing association out of which 8 indicated that the association was helpful to them by providing training.

The study also sought to find out if poultry processors had access to credit and insurance, Table 30, contains the results. The results in Table 30, reveal that of the 28 poultry processors 13 (46.4%) has access to credit in the last four to five years. According to the results, 10 of these processors got their credit from banks/ savings and loans/microfinance/ credit unions while the remaining 3 were from relatives. This disagrees with the findings of Mensah-Bonsu et al. (2019) who found only 4% of the processors along the broiler and layer value chain in the Brong-Ahafo region to have access to credit. On the insurance of poultry processing business 5, (17.9%) indicated that some aspects of their processing businesses were insured.

The socioeconomic characteristics of poultry processors presented in appendix Ef, reveal that a typical poultry processing business in the study area employs 7.42 persons who were all males and those under 36 years of age were 3.31 out of the 7.42.

In the processing industry, marketing is key to the activities of processors. For this reason, the results of how poultry processors market their products are presented in Table 32. The results show that the majority (75%)

of poultry processors have agreements with their customers whom they process for. Although 50% of these agreements were by word of mouth, 28% were, however, written agreements. Indeed, a study by Mensah-Bonsu et al. (2019) reported that 28.9% of poultry processors in Brong-Ahafo region were found to process for their customers based on contractual agreement, albeit the authors admitted that 92.3% of these contracts were by word of mouth and not written contracts.

Poultry processors' knowledge of regulations and regulatory agencies was also evaluated since they work within the confines of laws and regulations of the government which are enforced by key government ministries and agencies. These agencies also serve as institutions that provide support services to these poultry processors as such knowledge of these regulations and the regulatory bodies or agencies is critical for the sustainable development of the sector. Table 31 presents the results of poultry processors' knowledge of regulations and regulatory agencies. The results in Table 31 reveal that 60.7% of the 28 poultry processors were aware of the laws and regulations governing their activities, and the same number indicated that they have acquired a permit for their operations. However, only 46.4% and 32.1% indicated they have permits for their operations from the EPA and FDA respectively. Similarly, 17.9%, 53.6% and 78.6% said they have permits from GSA, VSD, and their respective District Assemblies to carry out their poultry processing activities. According to the results in Table 31, the majority (67.9%) of respondents considered the quality of services provided by these regulatory and support service provider institutions to be good with 53.6 % of them noting that the fees charged by these institutions were moderate.

Broiler Value Chain Map in Three Major Poultry-Producing Regions of Ghana

The broiler value chain map for Bono, Ashanti, and Greater Accra regions is shown in Figure 3. The map is drawn based on a field survey and review of available literature and government of Ghana documents from the Animal Production Directorate and Veterinary Service Directorate.

During the process (survey and literature review), the following were identified as the major actors of the domestic broiler value chain, input suppliers (toll feed mills and commercial feed mills), broiler producers (independent small-scale producers, independent large-scale producers, small-scale contract growers, large scale contract growers), marketers (retailers, independent wholesalers, wholesalers who are integrators) processors (small scale, independent large scale, integrator large scale) and consumers (households, commercial- hotels, restaurants, chop bars, fast food joint). The channels for product pathways based on the above-identified broiler value chain actors in the Bono, Ashanti, and Greater Accra regions are shown below.

- ✓ Input supplier → broiler producer → direct to consumer
- ✓ Input supplier → broiler producer → wholesalers→ retailers → consumer
- ✓ Input supplier → broiler producer → wholesalers → hawkers → consumers
- ✓ Input supplier → broiler producer → wholesalers → institutions → consumers
- ✓ Input supplier → broiler producers →hawkers → consumers
- ✓ Input supplier → broiler producers → poultry processors → consumers

- ✓ Input supplier → broiler producer → hotels → consumers
- ✓ Input supplier → broiler producer → restaurants → consumers
- ✓ Input supplier → broiler producer → institutions → consumers
- ✓ Input supplier → broiler producers → chop bars → consumers
- ✓ Input supplier → broiler producers → retailers → chop bars
- ✓ Input supplier → broiler producer→ integrator → consumers
- ✓ Input supplier → broiler producer → integrator → Processor→ consumers
- ✓ Input supplier → broiler producer→ retailer → consumer
- ✓ Input supplier → broiler producers → processors → fast food joints → consumer
- ✓ Input supplier → broiler producers → processor→ supper markets → consumer
- ✓ Input supplier → broiler producer → processor → consumers
- ✓ Input supplier→ broiler producer → processor → supper market → consumers
- ✓ Input supplier→ broiler producer → processor → shopping mall → consumers
- ✓ Input supplier → broiler producer → processor → fast food joints → consumers

Among the distribution pathways or channels the only one with three actors involved is input supplier, broiler producer and direct to consumer but the rest have four or five product distribution pathways.

Input Suppliers

The inputs considered for this study were feed, feed was sourced by broiler producers in three main ways, the producer bought the necessary ingredients from local or imported sources and then formulate the feed themselves (in the case of integrated farms and some independent producers) or sent the ingredients to a toll feed mill to do the formulation at a fee. The other sources include buying the already formulated or compounded feed from local commercial feed mills or importers who import the already prepared/compounded feed.

The feed supply to broiler producers, therefore, include own formulation, formulations from toll feed mills and already prepared or compounded feed (chick starter/mash, grower mash, and finisher mash) from local commercial feed mills or importers.

Other inputs that were identified include DOC, sourced from local hatcheries and importers, veterinary drugs and vaccines mainly imported to sell to broiler producers and equipment's sourced from local fabricators and imported sources as well as soybean and maize sources from aggregators who get their suppliers from foreign and local sources.

Broiler Producers

Broiler producers were independent producers if they are producing on their own by providing their own inputs and undertaking the processing and marketing of the products themselves. This was the case for most of the producers encountered during the study. As 68.8% of the 284 producers interviewed indicated they were independently producing (see Table 22).

However, 90 (31.2%) of the producers stated that they were contract growers (see Table 22). The package for contract growers might include supply of inputs such as DOCs, feed, drugs, and vaccines to produce for the contractor (a wholesaler or integrator). Depending on the number of birds a producer is raising, the producer can be a small-scale independent producer or a large-scale independent producer. Similarly, a contract grower depending on the flock size can be a small-scale contract grower or large-scale contract grower. However, the study found that the average number of DOCs used by producers per production cycle was 644 birds qualifying broiler producers in the study area as small-scale producers.

Marketers

Live birds sellers get their supply from the producers, who might be around where they operated in (the same town, district, or region). They were very critical to the growth of the broiler value chain in Ghana giving that 76.5% of the 284 broiler producers indicated that they sold their birds as live birds (see Table 22). The marketers are either operating as retailers if they were selling smaller number (1 to 9) of birds per consumer or wholesalers if they did it in larger number (10 to 20 or more) per consumer. These marketers or live birds sellers deal with almost all the various consumers in the industry including households, hotels, restaurants, institutions, chop bars, fast food joints.

Poultry Processors

Poultry processing was done in small scale or large scale after the processor get supply of live birds from a producer, wholesaler, or retailer of live birds. Some producers processed their own birds as a way of adding value

to their products to be able to sell giving that 29.4% of the 284 producers interviewed in this study said they processed and sold whole dressed birds and chicken cuts (see Table 22).

This category qualifies for small scale processing, same as those in live birds' markets who after a customer buys the bird they are tasked to slaughter and dressed for them at a fee. This is what most (64.3%) of the respondents indicated they were doing (see Table 32). The large-scale processors or commercial processors got their live birds from producers who might be independent or contract growers, and in some cases wholesalers to process into whole dressed birds or chicken cuts for sale to consumers. About 75.0% of the respondents say they process birds into whole dressed birds.

Consumers

The consumers end the channel or product pathway of the broiler value chain map. Consumers included households at the family level or individuals and for commercial consumers, the list included hotels, restaurants, chop bars, fast food joints.

Support Service and Regulatory Institutions

The results of analysed field dada, available literature and government documents were used to identify key government agencies that have role in the regulation and sustainable development of the domestic broiler value chain. The institutions identified included EPA, FDA, GSA, VSD, APD, and Actors Associations. The rests were District Assemblies, EHD, financial institutions such as banks and insurance companies (see Tables 16, 21, 27 and 31).

These institutions provided regulatory oversight for the chain and support services such as technical backstopping activities. While the banks

and allied financial institutions provided credit and risk mitigating policies for chain actors. However, respondents per the data they provided seemed to be working mostly with their respective District Assemblies, Veterinary Service Directorate, and banks.

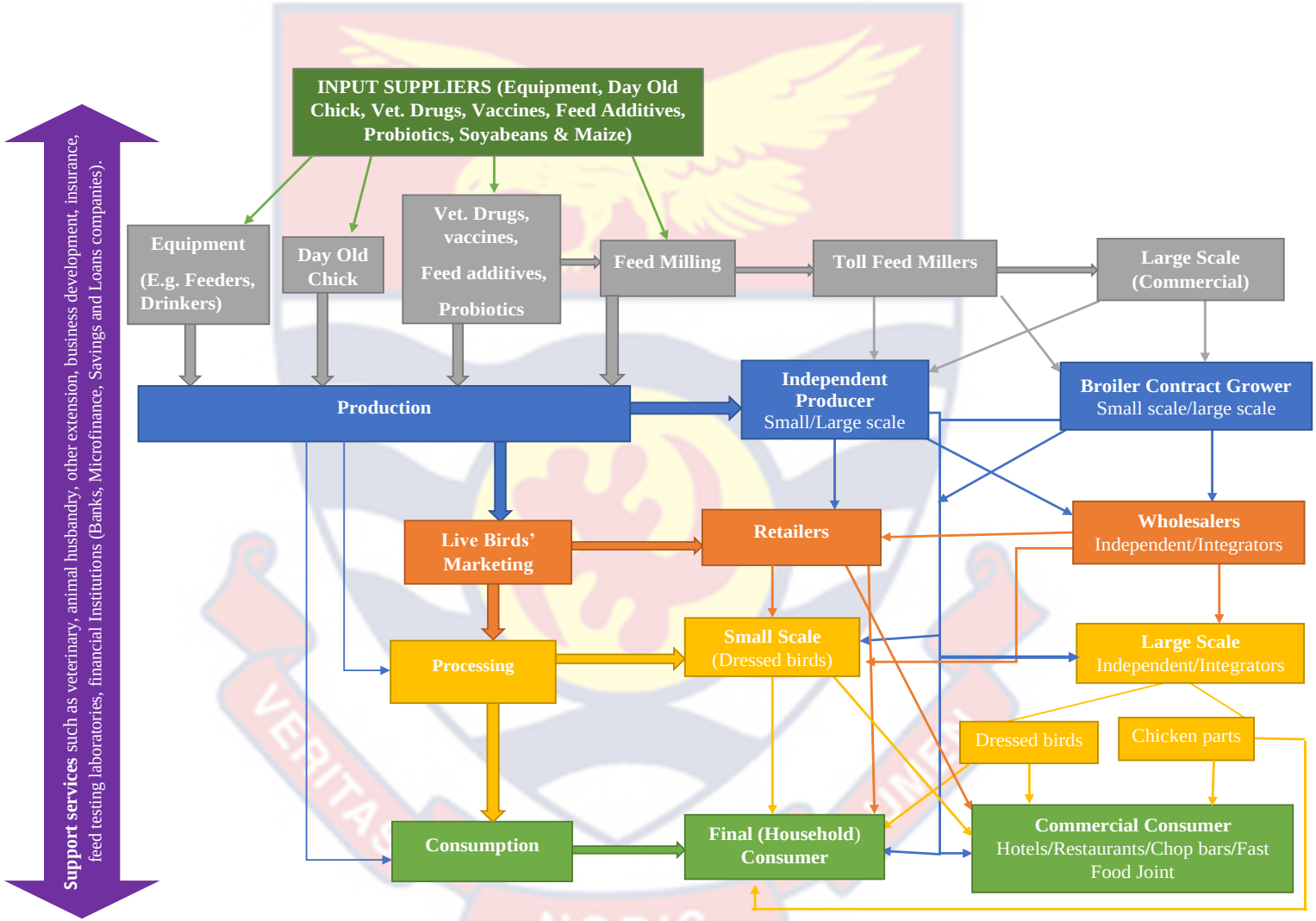

Figure 3: Broiler Value Chain Map in Three Major Poultry-Producing Regions of Ghana. Source: Author's construct (2022)

The Map in Figure 3 shows that the broiler value chain in Bono, Ashanti, and Greater Accra regions is an extended value chain since there are many links in the chain. Resulting in many value chains, which can be described as "manifold links" (Kaplinsky & Morris, 2001). This demonstrates some degree of vertical integration as the actors appear to be involved and control more than one activity of the chain. About 13% of broiler producers in the study area have and operate feed mills purposely for their farms or to feed their birds (see Table 14), while 31.1% of the producers, are producing under contract for integrators (see Table 22). At the same time 29.4% of the producers also processed and sell the dressed birds and chicken cuts (see Table 22) implying they control the processing and marketing component of the chain as well. These developments above are typical vertical integration approach in the Brazilian (Valdes et al., 2015) and USA broiler industry (National Chicken Council, 2021).

Matrix of Strengths, Weakness, Opportunities, and Threats (SWOT) Analysis of Broiler Value Chain in Three Major Poultry Producing Regions of Ghana

SWOT analysis of the broiler value chain in Bono, Ashanti, and Greater Accra regions was conducted and the results presented in Figure 4.

Strengths

Chicken meat is widely known to be white and healthy as such posed no health risk to consumers and is accepted by the dominant religious groups in Ghana's population. There is also an increased food safety consciousness among Ghanaian middle class who demand locally produced and processed fresh chicken than imported frozen chicken. As the incomes of Ghanaians continue to rise coupled with demographic changes to the population, which

would see an increase in the youth population. The demand for and consumption of chicken meat and products is expected to continue to grow in Ghana and the African continent, for the next 10 to 25 years.

There is also an increasing presence of fast-food joints both local and international in Ghana that uses large amounts of chicken and chicken products. These fast foods joints include KFC, Taco bell, chicken republic, papa yɛ fast food, Galitos, and Jofel Restaurant and Catering Services. Additionally, several shopping malls and supper markets have also sprung up in major towns and cities across Ghana, where they have sections dedicated to fresh chicken produced and processed in Ghana, these include Accra mall, Marina mall, Legon mall, A&C mall, and Kumasi mall as well as the SG mall in Kumasi among others. These shops aid in the marketing of domestic produced and processed broiler.

Aside the gaining of animal protein from chicken meat and its wide acceptability espoused above, and the marketing windows available for chicken meat and products in Ghana. The activities undertaken to produce and market broilers is also a source of livelihood and employment to the actors that engage in the broiler value chain.

There is also the availability of critical production inputs such as land across Ghana. The same can be said of support services in the likes of veterinary, animal husbandry, financial, insurance, feed testing laboratories all aim at ensuring the smooth running of the industry.

Weaknesses

Though the benefits and gains of the domestic broiler value chain have been outlined, it is still confronted with challenges that affect its consistent

growth and ability to spread the gains. These include the lack of coordination among actors in the broiler value chain. Which affects the flow of information and heightens mistrust among actors.

There are very few integrators operating in the domestic broiler value chain, and this has increased the risk for actors in the chain, at the same time affecting their access to production technology and availability of working poultry processing facilities. Also, given the competition between poultry and humans for maize and soybean as feed (feed-food competition) in Ghana, the inability of the national agricultural systems to sufficiently produce enough maize and soybean to meet domestic consumption is grave for the broiler industry.

There is also problem with credit accessibility by broiler value chain actors, a capital-intensive industry such as the broiler value chain requires access to cheap capital to innovate and upscale. It does appear that the chain actors lack the capacity to access capital from financial institutions. They are either not able to meet the requirements of financial institutions or not able to put together a credit proposal to financial institutions that these institutions considerer credit worthy.

These challenges are further worsened by the fact that there is the lack or absence of clear cut government policy guiding and providing an enabling environment for the sustainable growth and development of the domestic broiler value chain.

Opportunities

As the population of Ghana grows and the income levels of the citizens improve it is expected that the demand for chicken would continue to increase.

Aside from this, there are other opportunities that the domestic broiler value chain actors can tap into to market their products and grow their businesses.

The operationalization of the African Continental Free Trade Area (AfCFTA) has created a large market for broiler value chain actors to sell their products. The broiler value chain holds the key to the generation of sustainable employment for chain actors and adjoining sectors such as maize and soybean farmers as well as processing and transportation industries. The growth of the domestic broiler value chain has a great multiplier effect that goes beyond actors of the chain.

Threats

Despite the opportunities inherent in the domestic broiler value chain, yet it is confronted with unrestricted importation of frozen chicken meat and chicken products into Ghana. This allows the importation of any amount of frozen chicken by anybody from any country at any time of the year into Ghana. The practice brings in frozen chicken with prices that are far lower than locally produced and processed chicken, resulting in the inability of local producers and processors to sell their products as significant number of Ghanaian consumers are price sensitive. Hence their consumption choices are largely driven by product price. Since domestically produced and processed chicken are not price competitive when compared with imported frozen chicken.

The price difference between imported frozen chicken and Ghanaian-produced and processed chicken may also be influenced by the cost of production inputs. The cost of production inputs used by domestic broiler value chain actors to produce is very high particularly, feed, veterinary drugs,

and vaccines. Once the actor produces at a higher cost and is not successful in passing on the cost to consumers the business would collapse.

One reason for this high cost of broiler production inputs for domestic producers is that most of these production inputs (day old chicks, veterinary drugs, vaccines, blended/compounded feed, feed ingredients, and production equipment) are imported. This predisposes the industry to international market forces including the depreciation of the Ghana cedi against the US Dollar and other major currencies.

All these have been compounded by the seeming lack of regulation and/or failure to enforce regulations governing the activities of the domestic broiler value chain. This would probably address the issue of the importation of frozen chicken and help in finding local alternatives to imported inputs.

Against this backdrop, there is unwillingness on the part of financial institutions to lend to actors of the broiler value chain. This has made access to credit by many broiler value chain actors extremely difficult. At instances where they have access to credit, they do so at a very high interest rate that their businesses are not able to payback.

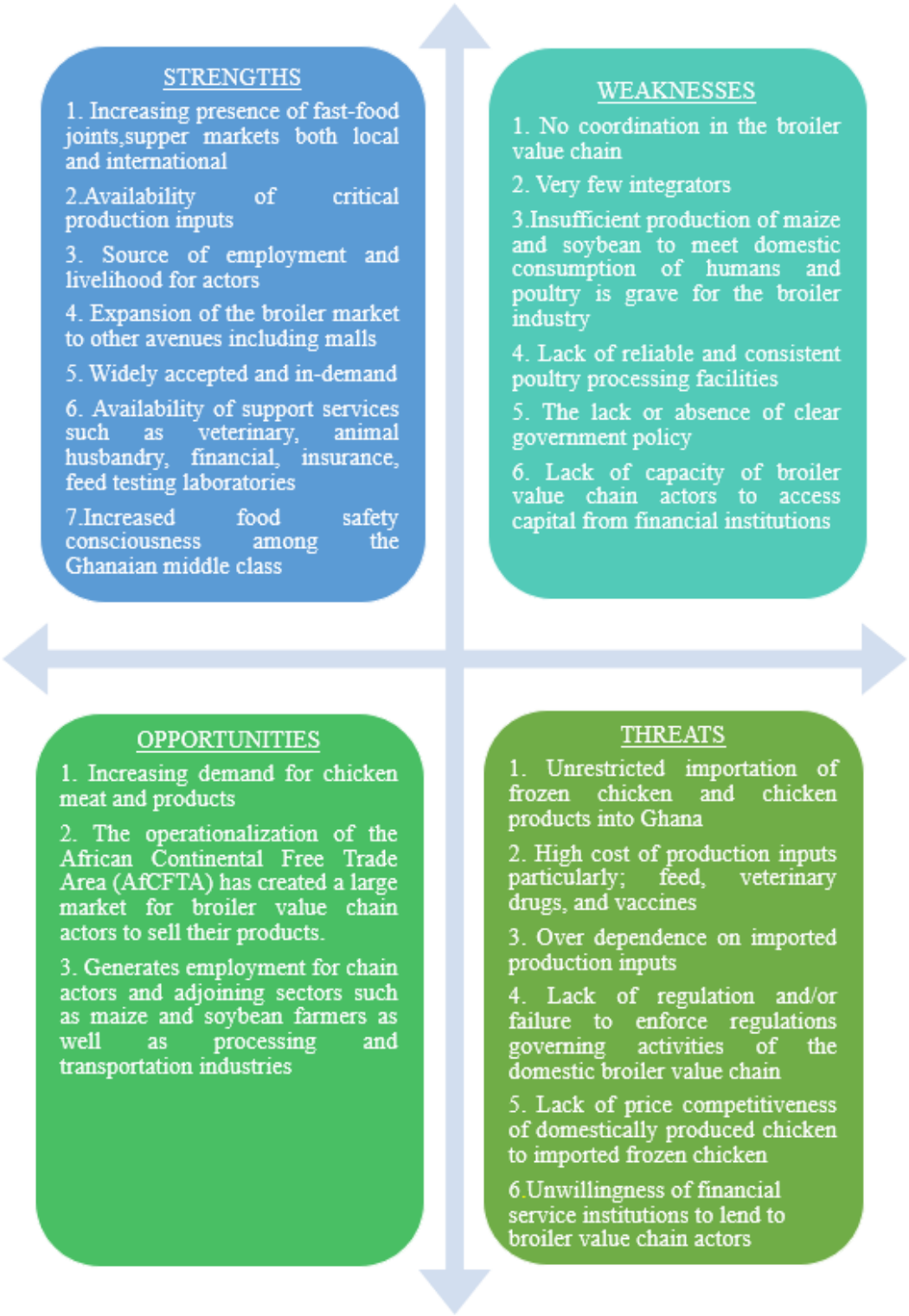

Figure 4: Matrix of SWOT Analysis of Broiler Value Chain in Ghana

Evaluation of Challenges in Selected Broiler Value Chain Activities in Ghana

The objective two of the study evaluated the challenges inherent in the domestic broiler value chain. The four nodes of the broiler value chain considered were input supply (feed), production, poultry processing and marketing. Actors at these nodes were asked to rank their challenges on a five-point Likert scale. The results of the Kendall's coefficient of concordance are presented in Table 12 to 19.

Production Challenges of Feed Millers

Feed milling is critical to the broiler value chain in supplying the feed that is used to feed the birds. Across Ghana, it is carried out by different types of operators aside the few integrated farms that use their own feed mills for their farm production activities. There are commercial and toll feed mills. Feed mill operators were asked to rank the challenges they were confronted with in their business. The 46 feed millers that responded to the interview schedules, had 36% agreement among them in ranking the challenges (see Table 34). This implies a weak agreement and the confidence in rank is low as per Schmidt (1997).

Table 34: Production Challenges of Feed Millers

Variable	Mean	Rank
Price volatility of maize and soybeans	5.14	1st
High energy cost (fuel and electricity)	5.45	2nd
High transportation cost	5.46	3rd
Limited access to key ingredients for feed formulation (e.g. Low volumes of maize)	5.47	4th
High interest rate on loans	5.52	5th
Limited access to laboratory for testing ingredients	6.08	6th
Limited access to credit	6.40	7th
Low level of research and knowledge transfer	7.40	8th

Table 34 continued

Price volatility of other inputs apart from maize and soybean	8.65	9th
Limited capacity to meet government regulations	8.95	10th
Limited production capacity	9.11	11th
Inadequate training for feed millers	9.67	12th
Environmental regulation	10.04	13th
High labour cost	11.66	14th
Test Statistics		
N	46	
Kendall's W	0.363	
Chi-Square	217.023	
DF	13	
Asymptotic significance	0.000***	

p < 0.05. *** represent a significance level of 1%. Field survey, Tuoho (2022).

Per the results from Table 34, price volatility of maize and soybeans (mean = 5.14) was ranked the foremost important challenge. Whiles high energy cost [fuel and electricity] (mean = 5.45), High transportation cost (mean = 5.46) and Limited access to key ingredients for feed formulation [e.g. Low volumes of maize] (mean = 5.47) were ranked second, third and fourth respectively. Respondents, however, ranked high labour cost (mean = 11.66) as the least challenge, suggesting that it was not a major challenge to feed milling business in the study area.

The main ingredients for the feed milling industry in Ghana is maize and soybean (Amanor-Boadu et al., 2016; Andam et al., 2017), often national production does not meet their demand (Ministry of Food and Agriculture, 2017). Feed mills often resort to importation of soybean and maize to plug the shortfall in national supply (Bekoe, 2021).

As importation is purely an international trade issue, once international market forces are brought to play, how a country's currency fair against other major international currencies is critical in this sense. It is, therefore, not

surprising to see the actors in the feed mill industry ranking the price volatility of maize and soybeans as their number one most important challenge, given that this year (2022) the Ghana cedis have lost more than 37% of its value against the US dollar and other major international currencies (Bank of Ghana, 2022).

Since fuel pricing in Ghana is linked to the US dollar cedi exchange rate, it is not surprising feed millers ranked high energy cost (fuel and electricity) and high transportation cost as the second and third most important challenges confronting their businesses. The production activities or milling of feed dependent on power supply either by generators or electricity from the national grid.

Feed millers also require transportation to move purchased feed ingredients such as maize and soybean to mills for production and to transport their products to marketing centres to market. These two challenges are core to the feed milling business. The findings agree with what has been postulated by Babu and Shishodia (2017) that national level macroeconomics are critical to agribusiness competitiveness. Ghana's currency depreciation has taken a grave bite at feed millers.

Limited access to key ingredients for feed formulation (e.g. Low volumes of maize) were ranked the fourth most pressing challenge that actors of the feed milling industry are grappling with. The inadequate supply of soybean, yellow and white maize, and other feed ingredients to feed mills and other poultry value chain actors are known and reported (Andam et al., 2017), and a key justification for the government of Ghana planting for food and jobs programme (Ministry of Food and Agriculture, 2017).

The least ranked challenge by feed millers was high labour cost. Which imply it was not a major limiting factor to the profitability and growth of their businesses.

Marketing Challenges of Feed Millers

Challenges faced by feed milling actors in their quest to market their products were identified and ranked, analysed using Kendall's coefficient of concordance and the results are presented in Table 35.

Table 35: Marketing Challenges of Feed Millers

Variable	Mean	Rank
Pricing difficulties	2.65	1st
Stiff competition from imported poultry feed	3.32	2nd
Limited access to current market information	4.00	3rd
Low demand for feed by poultry farms	5.42	4th
Lack of specialised vehicles to transport feed	5.71	5th
Lack of specialised warehouses for feed storage	5.96	6th
Inaccessible distribution due to distance	6.28	7th
Inaccessibility of feed mills due to distance	6.34	8th
Poor storage/holding pens	7.54	9th
Marketing site location (place to market product)	7.79	10th
Test Statistics		
N	49	
Kendall's W	0.380	
Chi-Square	167.589	
DF	9	
Asymptotic significance	0.000***	

p < 0.05. *** represent a significance level of 1%. Field survey, Tuoho (2022).

The agreement among the 49 actors that did the ranking was 38%. Per, Schmidt (1997) it implies a weak agreement and the confidence in rank is low. The results in Table 35, show that the most pressing challenge of marketing to feed millers is pricing difficulty (mean = 2.65). Stiff competition from imported poultry feed (mean = 3.32) placed second in the ranking, whiles limited access to current market information (mean = 4.00) and low demand for feed by poultry farms (mean = 5.42) placed third and fourth respectively.

Marketing site location (place to market products) was, however, ranked least, implying that it was not a major challenge to actors.

Dealing with a prolonged period of currency depreciation (Bank of Ghana, 2022), in the country has affected the feed milling industry which depend on importation to source its production inputs (Bekoe, 2021). This explains why actors had difficulty in pricing their products and have ranked it the first, as most pressing challenge of the industry.

Stiff competition from imported poultry feed and limited access to current market information were ranked second and third most important challenges confronting the marketing of feed mill products by actors. Broiler producers and other consumers of feed either buy imported feed or locally produced feed from commercial feed mills. The second ranked challenge show that the local feed mills are struggling to compete, which may be because of their inability to produce exactly what their customers/consumers want.

This can be due to lack of information on what customers want in terms of quantity, time for delivery or when the product is needed, and the quality required as well. This is in tandem with the ranking of limited access to current market information. Actors also ranked low demand for feed by poultry farms as the fourth challenge. This may be because, some producers have chosen to patronise imported feed which is affecting the demand for feed produced by local feed mills, or it is because the broiler production industry continue to contract with more poultry business closing as reported (Amanor-Boadu et al., 2016). The low demand for feed may also explain why feed mills were operating below their average installed capacity of 10.64 Mt per week to 7.07 Mt per week at the time of the interview.

Least ranked challenge was marketing site location (place to market products). This imply that where the shop or production facility was located did not affect the ability of feed millers to sell their products or get customers for their products. This might be due to improvement in information and communication technology which has made it possible to use social media to market products and make payments for services through mobile money and other E-payment platforms or feed millers have advertised their products so well to their customers that location of their products was no longer an issue in the marketing.

Challenges of Broiler Production

The results of challenges ranked by broiler producers in terms of their production activities are presented in Table 36, in a descending order of importance.

Table 36: Production Challenges of Broiler Producers

Variable	Mean	Rank
High feed cost	5.05	1st
Lack of government subsidy	5.79	2nd
High cost of credit	6.30	3rd
High cost of day-old chicks	6.92	4th
High level of importation of poultry production inputs	6.96	5th
High cost of vaccines	7.17	6th
Lack of quality day old chicks from most local hatcheries	7.88	7th
Lack of credit facility	8.06	8th
Lack of access to improved broiler breeds	9.47	9th
High energy cost (fuel and electricity)	9.47	10th
Diseases outbreaks	9.98	11th
Lack of insurance policy	10.09	12th
Low level of research and knowledge transfer	10.48	13th
Inadequate capacity building programmes for farmers	10.98	14th
High labour cost	11.98	15th
Government regulations (EPA, FDA, VSD)	12.17	16th
Lack of access to extension services (veterinary or animal husbandry)	14.25	17th
Test Statistics		
N	228	
Kendall's W	0.310	
Chi-Square	1130.197	
DF	16	
Asymptotic significance	0.000***	

p < 0.05. *** represent a significance level of 1%. Field survey, Tuoho (2022).

There was a 31% agreement among the 228 broiler producers. Per the results from the Kendall's coefficient of concordance. The implication of this is that there was a weak agreement among broiler producers in the ranking culminating in a low confidence in rank (Schmidt, 1997).

Among the major challenges were high feed cost (mean = 5.05), lack of government subsidy (mean = 5.79), high cost of credit (mean = 6.30) and high cost of day-old chicks (mean = 6.92). These were ranked as the most important or pressing challenges with high feed cost being the foremost and lack of access to extension services [veterinary or animal husbandry] (Mean = 14.25) ranked the least challenge.

Broiler producers get feed for their production either using local or imported feed ingredients to compound the feed themselves (Bekoe, 2021), or buying already compounded and branded feed from importers or local commercial feed mills. This makes feed cost to depend largely on international market forces. With the current state of unprecedented depreciation of the Ghanaian cedi. It is understandable why broiler producers would consider feed cost as the number one major challenge to their production.

These findings agree with Etuah (2014) who in a study that measured the economies of scale and cost efficiency levels of broiler farms in the Ashanti region of Ghana found that farmers ranked feed cost as the number one challenge confronting their businesses. Contrary to this, Tuffour and Sedegah (2013) reported in a study that broiler producers in the Greater Accra region ranked competition from imported chicken as their number one challenge.

Feed cost has been found to be so high to the extent that, Etuah et al. (2020) reported it constituted 60% of the total cost of broiler production in the Ashanti Region, whiles Dziwornu (2014) noted that it accounted for 51% variable cost of producing broiler in the Greater Accra, Ashanti, and Brong-Ahafo Regions. In east Africa, however, feed cost constituted 80% of production cost (Vermooij et al., 2018), and in Malaysia it was reported to constitute 75% of production cost (Elsedig, Mohd, & Fatimah, 2015).

Lack of government subsidy (similar to how government subsidised fertilizer for crop farmers or free mass cocoa spraying for cocoa farmers) was ranked as the second most important challenge, a subsidy from government would have absorbed part of the cost of production, as has been the case in some subsidy programmes of government such as mass spraying for cocoa farms and fertilizer for crop farmers, where government absorbs a percentage of the cost (Ministry of Food and Agriculture, 2017). A subsidy for broiler producers would lower the risk associated with their businesses and cost of production.

It would also make these businesses competitive. Governments elsewhere including USA and EU member countries are reported to provide subsidies for broiler producers and other livestock producers (Gbedemah et al., 2018; Ayisi & Adu, 2016). This may be one of the reasons for their competitive urge over Ghanaian broiler producers. In that they can export and sell their products in Ghana at prices far lower than what is produce domestically.

However, Gulati et al. (2022) have reported that the lack of government subsidy is one of the major challenges confronting the broiler

value chain in India. The implication for the lack of subsidy for broiler producers in Ghana has been the uncompetitive nature of the industry (Sumberg, Awo, et al., 2017). This has resulted in the influx of imported frozen chicken which is cheaper than locally produced chicken.

In addition, high cost of credit and high cost of day-old-chicks were ranked as the third and fourth challenges respectively. Access to cheaper credit is critical to a capital intensive sector like broiler production but in Ghana producers do not have such access. Either due to capacity related issues on the part of individual producers or just that the lending financial institutions are not willing to lend due to the high-risk nature of the industry. Since access to credit has always require insurance cover as a condition the poultry sector in Ghana generally has no poultry specific insurance policy. Hence the unattractiveness of the poultry industry to banks and other financial institutions.

Again, many of the broiler producers in Ghana are not operating as integrated farms, one of the benefits in other parts of the world for operators of integrated broiler farms is access to cheaper credit (Walton & Grishin, 2018). In the Ghanaian context, therefore, a financial institution that decide to lend does it at a higher interest rate to be able to cover for the principal amount within the shortest possible time. This may be explained by the findings of Mensah-Bonsu et al. (2019) that among the poultry (broiler and layer) value chain actors studied in Dormaa and Sunyani only 16 percent of producers, 15 percent traders, and 4 percent of processors had access to credit.

Also, the high cost of DOC was considered as the fourth major challenge, DOCs are critical inputs to broiler producers. Broiler producers get

their DOCs either from importers of inputs or from local hatcheries. Most of the local hatcheries import the fertile hatch able eggs for hatching, as there are few parents' stock farms in Ghana supplying eggs to the hatcheries. Any of these channels' broiler producers get their DOCs from is not only constraint by international trade and market forces but international supply chain related issues. All these affects the price that broiler producers must pay for the DOCs. An earlier study by Dziwornu (2014) noted that the cost of DOCs was one of the major cost items in broiler production that can positively or adversely affect competitiveness.

Lack of access to extension services was ranked last, this implies that it is the least challenge faced by broiler producers in the Greater Accra, Ashanti and Bono Regions that participated in the study. Extension service in the broiler industry includes veterinary and animal husbandry services. These services in recent times are not only being provided by government but private veterinary clinics and input companies as part of their marketing services (Gary, 2019).

Also, broilers only take 6 weeks to mature, and the most critical vaccinations are always done before producers take delivery of the birds, it seems this reduces the disease burden of the flock and may make the services of veterinary not needed during the production cycle. This may explain why it is not a challenge to broiler producers. However, this finding disagrees with what has been reported in the Ghana living standard survey round 7 report that found 74% of respondents in the survey reporting difficulties in getting veterinary services [vaccinations and medicine] (Ghana Statistical Service, 2019b).

Marketing Challenges of Broiler Producers

Broiler producers were asked to also rank the challenges they faced in marketing the broilers they produce. The Kendall's coefficient of concordance results of this, is presented in Table 37.

Table 37: Marketing Challenges of Broiler Producers

Variable	Mean	Rank
Competition from cheap poultry meat import	1.91	1st
Customers taste and preferences	3.94	2nd
Income level of customers/consumers	4.26	3rd
Lack of access to current market information	4.59	4th
Time spent to dress bird	5.13	5th
Level of health awareness or consciousness of consumer	5.34	6th
Distance to market where birds are sold	5.97	7th
Level of education of consumers	6.10	8th
Marital status of consumers	7.76	9th
Test Statistics		
N	238	
Kendall's W	0.412	
Chi-Square	784.980	
DF	8	
Asymptotic significance	0.000***	

p < 0.05. *** represent a significance level of 1%. Field survey, Tuoho (2022).

There was 41% agreement among broiler producers in the ranking of these challenges. This implies a weak agreement and the confidence in rank is low among the broiler producers on their marketing challenges (Schmidt, 1997).

The broiler producers ranked competition from cheap poultry meat import (mean = 1.91) as the foremost challenge and customers taste and preferences (mean = 3.94), income level of customers (mean = 4.26), and lack of access to current market information (mean = 4.59) as the second, third and fourth most important challenge respectively. However, marital status of consumers (mean = 7.76) was ranked as the least challenge.

Chicken meat constitute about 97 percent of all the poultry meat imports into Ghana (Bank of Ghana, 2021), this imported meat comes in the form of processed chicken cuts and a few as dressed whole birds. It affects broiler producers' ability to sell their live birds, for several reasons, according to Asante-Addo and Weible (2019) the consumption of chicken meat in Ghana is influenced by, gender, households with children, increased income, distances to the nearest chicken meat shop, availability, and convenience. The rest are employment status, house-hold income level, food safety consciousness, price sensitivity, quality, and ethnocentrism.

A live bird is not convenient to consumers compared to the dressed and cut chicken that is imported, the imported chicken is also cheaper than the live bird since the consumer is price sensitive they opt for the imported and not the live bird. Convenience is critical because chicken meat is consumed more in Ghana by urban dwellers (Sumberg et al., 2016), who may not have time to dress the birds themselves or wait at the wet market for the bird to be dressed for them. Hence, Nti (2018) reported that in 2014 about 67.48% of the chicken meat consumed in Ghana was imported. The results of this study have been collaborated by Onumah et al. (2021), and Tuffour and Sedegah (2013) all noting how grave the competition from cheap poultry meat imports was to broiler business in the country.

One of the critical factors that affects the decision to buy or not to by a product is consumer taste and preference. This has been ranked the second most important challenge to the ability of broiler producers to sell their products. Some of the factors that has been outlined to influence the consumption decisions of Ghanaians for chicken meat are certainly at play

(Asante-Addo & Weible, 2019), origin and price have also been reported to influence the consumption of chicken meat (Al-Hassan et al., 2014). In their studies, Kwadzo et al. (2013) in analysing preference of consumers for broiler meat attributes concluded that price was the most important to consumers, followed by proximity to the consumer, taste, and availability.

It is, therefore, important that broiler producers have taken note of customers taste and preferences. Asante-Addo and Weible (2020) also reported that taste was important to some chicken consumers in Ghana as they found domestic produced and processed broiler to taste better than imported frozen chicken and may opt for that.

Income level of customers was ranked third most important challenge to marketing of broiler by producers. Aside having the taste and preference, the ability to pay or having the purchasing power is important, this explains why Sumber et al. (2016) found that chicken was consumed in parts of Ghana where poverty was less endemic. It has also been reported that eating chicken meat was viewed as a luxury in Tanzania (Vermooij et al., 2018). These results concur with what has been reported locally and globally that income levels influence chicken consumption (Andam & Silver, 2016; Asante-Addo & Weible, 2019; Sumberg et al., 2016).

Lack of access to current market information was identified as one of the challenges and ranked fourth by broiler producers. This is worth noting considering the importance of information and market intelligence to the success of marketing. Broiler producers may want to have information on the demand of their products including markets or individuals that want to buy, the price buyers are ready to accept for broilers in different markets and

location so that they can take advantage of it. At the same time broiler producers may want to know specific requirements for their products, may be some consumers want the birds at 4 weeks or 6 weeks old and the times or seasons they should produce. This would enable them to meet the demand of the market (Babu & Shishodia, 2017).

The marital status of consumers was the least ranked challenge by broiler producers. In effect it was not a major challenge or issue in their quest to market their products. This finding seems to be out of synch with what has been reported, which suggests that house hold size was one of the drivers of chicken meat consumption in Ghana (Asante-Addo & Weible, 2020).

Production Challenges of Poultry Processors

Poultry processors were asked to rank the production challenges confronting their businesses. The Kendell coefficient of concordance result are presented in Table 38.

Table 38: Production Challenges of Poultry Processors

Variable	Mean	Rank
High cost of raw materials (live birds)	3.42	1st
High cost of equipment	3.98	2nd
High cost of electricity	4.38	3rd
Lack of funds to buy equipment	4.98	4th
Lack of raw material (live birds)	5.92	5th
Lack of entrepreneurial training	6.42	6th
Limited knowledge on how to process quality products	6.69	7th
Lack of proper packaging materials	6.92	8th
Inadequate transport infrastructure	7.02	9th
Poor quality of raw materials (live birds, etc.)	7.94	10th
Lack of electricity	8.35	11th
Test Statistics		
N	24	
Kendall's W	0.288	
Chi-Square	69.098	
DF	10	
Asymptotic significance	0.000***	

p < 0.05. *** represent a significance level of 1%. Field survey, Tuoho (2022).

High cost of raw materials (mean = 3.42), high cost of equipment (mean = 3.98), and high cost of electricity (mean = 4.38) were ranked first, second and third respectively. However, lack of funds to buy equipment (mean = 4.98) was ranked fourth whiles lack of electricity (mean = 8.35) was ranked the least challenge. Among the 24 poultry processors who responded to the interview schedule there was a 28.8% agreement among them on the ranking. This shows a very weak agreement with a confidence in rank being none among the poultry processors on the ranking of their production challenges (Schmidt, 1997).

The birds from broiler producers and others are the raw materials for processing. For the processors to have it ranked as the number one challenge confronting them suggest a number of possible scenarios. First the live bird markets may be competing with processors for the same raw material as such forcing the prices upward, secondly, broiler producers may be selling their products at higher prices to the processors. Which may be because of higher production cost they might have incurred (Al-Hassan et al., 2014; Kwadzo et al, 2013).

High cost of equipment was ranked second with lack of funds to buy equipment ranked fourth. This may be so since majority of the equipment's for poultry processing are imported.

High cost of poultry processing equipment's in Ghana has been acknowledged by Etuah et al. (2021) for this reason the author suggested that, for the business of processing to be viable the broiler processing business must be operating at a capacity of 500 birds per day. Since most of these equipment's are imported, it is possible for processors to consider something

like the mobile poultry processing unit (MPPU) which has gain traction in the USA (Mancinelli et al., 2018). The average cost of building an enclosed one is $95, 750 whiles that of the open-air cost $29,284 (O'Bryan et al., 2014). To construct stationary poultry processing facility will require $500,000 (Mancinelli et al., 2018).

The fourth ranked challenged was lack of funds to buy equipment for processing, since accessing credit from financial institutions has been reported to be difficult for processors and other actors of the poultry value chain in Ghana (McLeod et al., 2009; Mensah-Bonsu et al., 2019). Actors can consider using their production associations to raise money to help one another procure these equipment's or enter into a public private partnership with government to buy the equipment's.

High cost of electricity was ranked third whiles lack of electricity was ranked the least challenge facing actors of poultry processing during production. This result makes an interesting revelation, amid Ghana's economic difficulties the Public Utilities Regulatory Commission increased the cost of electricity to end users by 27.5% (Public Utilities Regulatory Commission, 2022). The World Bank also reports that access to electricity in Ghana per population is 83.5% (World Bank, 2022). This electricity tariffs increases may be part of the reason for the actors ranking high cost of electricity as the third most important challenge to them. The electricity penetration rate per population as reported by the World Bank may also be the reason for ranking lack of electricity as least challenge since most Ghanaians now have access to electricity. The findings agree with Sumberg et al. (2017)

and Babu & Shishodia (2017) on the critical role the nation/state must play in creating the enabling environment for agribusinesses to strive.

Marketing Challenges of Poultry Processors

The challenges poultry processors faced in marketing the chicken and chicken products they processed was ranked by 24 poultry processors and analysed using Kendall coefficient of concordance and the results presented in Table 39.

Table 39: Marketing Challenges of Poultry Processors

Variable	Mean	Rank
Lack of access to current market information	2.48	1st
Only a small fraction of the population are influenced by health and safety issues on decisions regarding what they consume	2.98	2nd
Poor handling and packaging system	3.50	3rd
Competition from imported frozen chicken	4.27	4th
Consumers are mostly driven by price not quality and safety	4.60	5th
Consumers taste and preference	5.58	6th
Time and convenience	6.25	7th
Lack of freezers and refrigerators	6.33	8th
Test Statistics		
N	24	
Kendall's W	0.502	
Chi-Square	84.321	
DF	7	
Asymptotic significance	0.000***	

p < 0.05. *** represent a significance level of 1%. Field survey, Tuoho (2022).

There was a 50.2% agreement among the actors in ranking the challenges. The implication of this is that there was a moderate agreement with a fair confidence in rank among the poultry processors (Schmidt, 1997).

The most pressing challenge which was ranked first is the lack of access to current market information (mean = 2.48), and the second was only a small fraction of the population are influenced by health and safety issues on decisions regarding what they consume (mean = 2.98), poor handling and

packaging system (mean = 3.50) was ranked third whiles competition from imported frozen chicken (mean = 4. 27) fourth and lack of freezers and refrigerators (mean = 6.33) ranked as the least challenge.

Lack of access to current market information was ranked as the most important challenge that confront marketing of dressed chicken, chicken cuts and other products by poultry processors. While competition from imported frozen chicken ranked as the fourth most pressing challenge. This may be due to the keen competition poultry processors appear to be in with the importers of frozen chicken. Since each year Ghana increases by 15.5% its total chicken imports of the previous year amount, and in the year 2018 alone, the nation imported chicken meat worth 174 million US dollars (Andam et al., 2017; Nti, 2018; Ofori-Atta, 2018b). Information on customer taste and preferences, prices they are ready to take and the times and seasons they need domestic processed chicken are critical. As well as the form in which they want the chicken whether whole dressed or chicken cuts. Most of the poultry processors operating deliver at the request of customers, this also makes market information important. Contrary, to this findings, Mensah-Bonsu et al. (2019) reported that among egg processors operating in the layer value chain in the Brong-Ahafo region, their number one challenge was lack of ready market for their products.

Only a small fraction of the population is influenced by health and safety issues on decisions regarding what they consume was ranked second most important challenge to marketing of domestic processed chicken and chicken products by poultry processors. This result agrees with what has been reported by Asante-Addo & Weible (2019) who noted that there was a

growing small number of the population becoming conscious of health and food safety issues and have factored that into their chicken consumption decisions. This small group of the Ghanaian population prefers domestic produced and processed chicken over imported frozen chicken. This group of consumers are critical for the poultry processors.

Poultry processors ranked poor handling and packaging system as the third pressing challenge while lack of freezers and refrigerators was ranked as the least challenge, implying it was not a major challenge to them. Refrigeration has a role to play in handling of processed chicken. It is also true that most of these actors involved in processing are lacking the capacity to package and brand their products given that agro processing in Ghana is yet to develop (Andam et al., 2017; Sumberg, Awo, 2017). There is therefore a lack of the requisite supply chain that supports the sector with the right logistics.

Marketing Challenges of Live Bird Sellers

The marketing challenges confronting the 90 live bird sellers in the study were ranked and analysed with Kendall's coefficient of concordance (see results in Table 40).

Table 40: Marketing Challenges of Live Bird Sellers

Variable	Mean	Rank
High cost of transportation	4.40	1st
Higher cost of feed	4.49	2nd
High cost of fuel	4.87	3rd
Competition with imported chicken	5.83	4th
Consumer taste and preference	5.87	5th
Higher taxes	6.31	6th
Limited marketing channels	7.01	7th
Lack of freezers and refrigerators	7.62	8th
Poor storage/holding pens	8.38	9th
Marketing site location	8.53	10th

Table 40 continued

Poor handling and packaging system	8.81	11th
High cost of electricity	9.22	12th
Lack of constant supply of electricity	9.67	13th
Test Statistics		
N	90	
Kendall's W	0.289	
Chi-Square	312.601	
DF	12	
Asymptotic significance	0.000***	

p < 0.05. *** represent a significance level of 1%. Field survey, Tuoho (2022).

There was 28.9% agreement among these actors in ranking the challenges. This shows a very weak agreement with a confidence in rank being none (Schmidt, 1997).

High cost of transportation (mean = 4.40) was ranked the number one challenge confronting live bird sellers followed by higher cost of feed (mean = 4.49), high cost of fuel (mean = 4.87) and competition with imported chicken (mean = 5.83) respectively. Lack of constant supply of electricity (mean = 9.67) was however, ranked last which imply it was not a major challenge confronting the live bird marketing business.

Live birds 'selling business strives through the ability of these actors moving from farm-to-farm buying birds in lots from broiler producers and transporting it to wet markets in towns and cities to sell. It is, therefore, in synch to have these actors rank the high cost of transportation as the foremost challenge and high cost of fuel as the third most import challenge to their business. Given the more than 60% increase in transport fares and fuel prices this year (2022). It needs to be added that, even before these development in the year 2022. Other authors have reported difficulty in transporting products

as the number one challenge among traders of the broiler and layer value chains in the Brong-Ahafo region, while high transportation fares was ranked fourth out of the challenges the traders faced (Mensah-Bonsu et al., 2019).

The second imported challenged that was ranked is higher cost of feed, live birds sellers buy the birds in bulk from broiler producers and keep in their selling pens. They retail the birds till it finishes, during this period they feed and water the birds, it is, and therefore, understandable for them to be concern with high feed cost which broiler producers in this study have ranked as their number one challenge. This notwithstanding earlier studies have also identified high cost of feed as a major challenge (Al-Hassan et al., 2014; McLeod et al., 2009).

Competition with imported chicken was ranked the fourth most important challenge to live bird sellers. It is ranked so because they both compete for the same customers, albeit live birds sellers' advantage may be that those consumers who go to wet markets are interested in eating 'fresh and healthy' chicken.

Lack of constant supply of electricity was the last ranked challenge per the ranking implying that it was not a major challenge to live bird selling business. However, constant supply of electricity is critical for live bird selling businesses as some slaughter birds that may be injured or sick and refrigerate it for sale. Aside this, the nature of the sheds in which many of the live bird sellers operate in, always build-up heat. This they normally control by turning on electric fans to provide ventilation.

To rank lack of constant supply of electricity as no challenge suggest that there is stable supply of electricity. This used not to be the case according

to what has been reported by Teye and Seidu (2018) who reported in their study that regular electricity outages in the Agona West District of the Central region was a major challenge confronting cold-stores ability to sell chicken meat.

Profitability Analysis of Actors of the Domestic Broiler Value Chain

This objective (objective 3) seeks to conduct profitability analysis of the activities of major domestic broiler value chain actors (broiler producers, poultry processors and live bird sellers). The focus was the gross margin per bird, profit share per actor and profit efficiency.

Gross Margin and Profit Share of Major Domestic Broiler Value Chain Actors

The gross margin of broiler producers, poultry processors and live birds' sellers were analysed and presented in Table 41.

Table 41: Gross Margin (Per Bird) by Broiler Value Chain Actors

Actor	Mean (GH¢)	Percentage share (%)
Broiler producers	28.4	36.6
Poultry processors	20.9	27.0
Live birds' sellers	28.2	36.4
Total	**77.5**	**100**

Source: Field survey, Tuoho (2022).

The results in Table 41 show that broiler producers received a gross profit of GH¢ 28.4 per bird. However, poultry processors who add value to the birds produced by broiler producers had a gross profit of GH¢ 20.9 and live birds' sellers who also get their supply from the broiler producers had a gross profit of GH¢ 28.2. Amanor-Boadu et al. (2016) reported an average gross margin of GH¢ 8.87 per bird in Ghanaian broiler farms. Additionally, Mensah-

Bonsu et al. (2019) reported a gross margin of GH¢ 8.06 per bird for broiler producers, GH¢ 14.72 per bird for traders and marketers, and GH¢ 5.40 per bird for poultry processors in the broiler value chain. Similarly, Onumah et al. (2019) reported a gross margin of GH¢ 1155.6 (per 100 birds) for broiler producers, GH¢ 813.5 (per 100 birds) for distributers or marketers and GH¢ 1066.7 (per 100 birds) for processors of the broiler value chain of southern Ghana. On the other hand, Yevu and Onumah (2021) reported a gross profit of GH¢ 9.4971 per bird among layer farmers in the Greater Accra and Brong-Ahafo regions.

In terms of the share of the gross profit along the chain broiler producers has 36.6%, whiles poultry processors had 27.0% and that of live birds' sellers was 36.4%. The results show that despite the challenges confronting actors of the domestic broiler value chain. Their activities are still profitable, and efforts must be made to help addressed these challenges to make the sector more profitable.

Profit Efficiency of Selected Broiler Value Chain Activities in Three Major Poultry Producing Regions of Ghana

The purpose of objective three (3) was to conduct a profitability analysis of the activities along the domestic broiler value chain. The actors' activities include broiler production, live bird selling, and poultry processing. The profitability analysis would help identify the predictors of profit efficiency in the activities of actors. This has a policy implication as it would help Government and other stakeholders formulate policies that would create the enabling environment for broiler value chain businesses to strive.

Profit efficiency has often been estimated using the frontier method. This frontier approach has two forms in which profit efficiency is estimated. The two approaches are the stochastic frontier approach (SFA) and the data envelopment analysis (DEA).

The data envelopment analysis (DEA) model conforms to non-parametric analysis, and used to calculate the relative efficiencies of decision making units (DMUs) through linear programing, it has some advantages including the ability to measure relative efficiency when compared to the best observation. However, it is disadvantaged by the fact that it is not able to proffer how efficiencies can be improved (Jordá et al., 2012). At the same time, the DEA is also is extremely sensitive to outliers [extreme observation] (Allin et al., 2012).

The SFA is a parametric approach, through the building of frontier and taking into account randomness in calculating efficiency. Comparatively, the SFA has low sensitivity to extreme observations but high sensitivity to underperforming DMUs when compared to the DEA model (Allin et al., 2012). SFA is known to conform to parametric analysis while the DEA is a non-parametric analysis (Arbelo et al., 2021). For this analysis, the stochastic frontier approach (SFA) was chosen since the data for the study is fit for this parametric analysis.

Estimates of Profit Efficiency in Broiler Farms for Three Major Poultry Producing Regions of Ghana

The stochastic profit frontier analysis of broiler farms was carried out using the stochastic translog profit function model. Prior to this, the maximum likelihood estimation using the stochastic translog profit function and the

Cobb-Douglas production function was carried out to test the fitness of these models. To ascertain which one best fit the data set.

The results of the log-likelihood ratio test shows that the Translog profit function had a ratio of -86.855 while the ratio for Cobb-Douglas production function was -117.810 (see appendix H). Since -86.855 is larger, the Translog profit function was selected over the Cobb-Douglas production function that recorded a lesser log-likelihood ratio of -117.810. This demonstrates that the Translog profit function was more flexible than the Cobb- Douglas production function and fits the data from broiler production in the study area. Hence, the ability of the Translog profit function to explain the predictors of profit efficiency among respondents in the study area (Wongnaa et al., 2019).

The results of the analysis carried out using the Translog profit function model are presented in Table 42.

Table 42: Estimates of Profit Efficiency in Broiler Farms for Three Major Poultry Producing Regions of Ghana

Variable	Coefficient	Standard Error
Intercept	1.557	1.328
lnFeed	0.605*	0.339
lnVaccine and drugs	1.543***	0.263
lnMis (Miscellaneous)	-1.249***	0.235
lnDOC (Day old chicks/Birds)	0.305	0.228
lnOthers	-4.98*	0.293
0.5lnFeedlnFeed	0.075	0.071
0.5lnOtherslnOthers	0.241***	0.039
0.5lnDOClnDOC	0.639***	0.0597
0.5lnVaccinelnVaccine	0.0224	0.071
0.5lnMislnMis	-0.075**	0.037
lnDOClnFeed	-0.509***	0.056
lnDOClnVaccine	-0.248***	0.036
lnDOClnMis	-0.109***	0.036
lnDOClnOthers	0.258***	0.054
lnFeedlnVaccine	0.1801***	0.059
lnFeedlnMis	0.459***	0.039
lnFeedlnOthers	-0.3004***	0.054
lnVaccinelnMis	-0.178***	0.023
lnVaccinelnOthers	-0.011	0.0404
lnOtherslnMis	-0.046*	0.026

Table 42 continued

Diagnostic statistics	
Sigma square	1.9002***
Gamma	1.000***
Log-likelihood value	-86.855
Likelihood ratio test (with Cobb-Douglas)	61.91***
Mean efficiency	0.629

*, **, and *** represent a significance level of 10%, 5%, and 1% respectively.
Source: Field survey, Tuoho (2022).

Table 42 results reveal that the estimated sigma square (σ^2) value was 1.9002 and statistically significant at 1% alpha level. The results indicate that the Translog profit function model was a good fit and the assumptions of random distribution of errors was correct. At the same time the results reveal that inefficiencies exist among broiler farmers in the study area and that the application of the stochastic frontier profit function in modelling profit efficiencies of the producers was appropriate (Wongnaa et al., 2019). Similarly, gamma (γ) estimate was 1.000 and statistically significant at 1% alpha level, implying that the profit inefficiency effects are significant in determining the level and differences in the production of broilers in the study area (Yevu & Onumah, 2021).

While the wald chi-square statistic of the Translog profit function was 69.91 and statistically significant at 1%, implying joint significance of the model (Wongnaa et al., 2019).

Further, the results in Table 42 shows that the coefficient for the cost of vaccine and drugs had a positive relationship with gross profit and was statistically significant at 1%. Implying that an increase in the unit price of vaccine and drugs would lead to a similar increase in the gross profit of broiler producers in the study area. Understandably, prophylaxis and curative treatments using vaccines or drugs are critical for promoting and maintaining broiler health in order to reduce or prevent mortalities in the flock. Hence

purchasing vaccines and drugs for use on bird flock would reduce bird mortality to ensure more birds reach market age. Yevu and Onumah (2021) has reported similar findings in layer farms in the Greater Accra and Brong-Ahafo regions of Ghana, in which a 1% increase in the quantity of medicine and vaccines used was found to result in a 0.67% increase in the output performance of layer birds in the study area.

On the contrary, Tuffour and Oppong (2014) in their study that used the Cobb-Douglas model to estimate the profit efficiency of broiler farms in the Greater Accra region, found that the coefficient of the cost of medication and vaccines was negative but not statistically significant.

Additionally, the coefficient of miscellaneous cost was negative and statistically significant at 1%. This implies that miscellaneous cost has a negative relationship with profit. A unit increase in miscellaneous cost (cost incurred on for example water, lightening or electricity, transportation of goods, litter, milling of maize, credit cost/ source, maintenance/repairs, charcoal) reduces the gross profit of the broiler producer.

It is understandable that miscellaneous cost which entail cost items including water, lightening or electricity, transportation of goods amongst others were making broiler producers in the study area to be profit inefficient and for that matter their businesses unprofitable. As most of these items have seen an unusual increase in prices due to the economic challenges the country is facing (Bank of Ghana, 2022; Public Utilities Regulatory Commission, 2022).

The coefficient of the cost of feed was positive and statistically significant at the 10% level, as such feed cost have a positive relationship with

the gross profit of broiler producers in the study area. This implies that an increase in the cost of feed would result in the increase in the gross profit of broiler producers. It could be inferred that since broilers are to convert feed to meat for sale, buying and making available quality feed for the birds would result in efficient conversion of the feed into meat for the birds to reach market weight early for sale, this certainly has the potential to increase the gross margin of the producer. This finding disagrees with what has been reported by Tuffour and Oppong (2014), and Yevu and Onumah (2021) who found a negative relationship with gross profit and the coefficient was significant at the 1% level in broiler and layer farms respectively.

However, the coefficient of other cost was statistically significant at 10% but had a negative relationship with gross profit. Which implies that other cost decreases the gross profit of broiler producers in the study area. Related studies including Tuffour and Oppong (2014) have also reported a negative relationship with gross profit and a statistically significance at 1% in broiler farms. Whereas Yevu and Onumah (2021) reported a negative relationship with gross profit among layer producers but not statistically significant.

The interaction effects of the variables (0.5lnOtherslnOthers, 0.5lnDOClnDOC 0.5lnMislnMis, lnDOClnFeed, lnDOClnVaccine, lnDOClnMis lnDOClnOthers, lnFeedlnVaccine, lnFeedlnMis, lnFeedlnOthers, lnVaccinelnMis) were all significant at 1% while lnOtherslnMis was significant at 10% and had a negative relationship with gross profit. The same as 0.5lnMislnMis, lnDOClnFeed, lnDOClnVaccine and lnDOClnMis

although significant at 1% they were all having a negative relationship with gross profit of broiler producers in the study area.

Distribution of Estimated Profit Efficiencies of Broiler Producers

The distribution of the profit efficiency scores among broiler producers in the study area are presented in Figure 5. The minimum profit efficiency of broiler producers in the study area was 0.99% and the mean (average) 62.9% while the maximum was 99.97%.

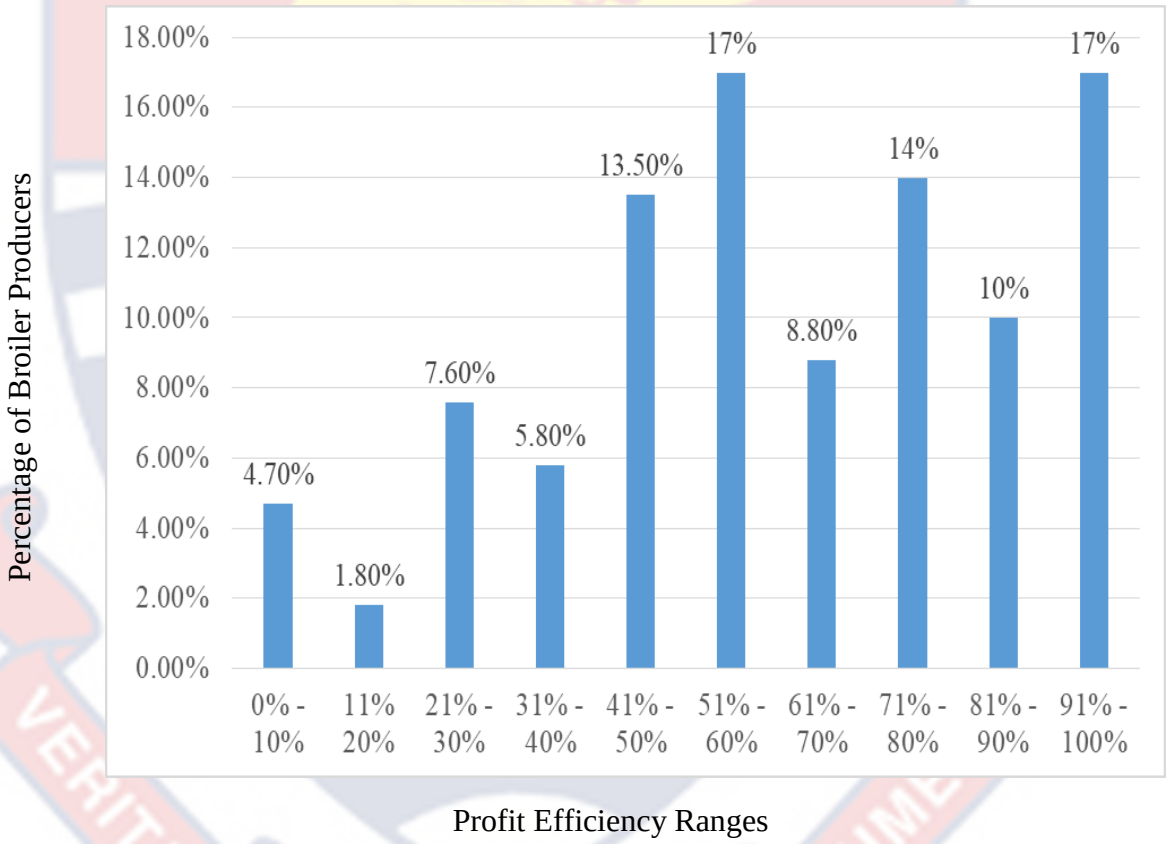

Figure 5: Distribution of Estimated Profit Efficiency Scores among Broiler Producers.

The broiler producers in the study area obtained an average profit efficiency score of 62.9%. It implies that given the available technology broiler producers were producing below the profit frontier and inefficient by 37.1% and has the scope in the short run to increase their profit by 37.1% through adopting the best broiler production technologies and practices.

Among broiler producers studied in the Greater Accra region, Tuffour and Oppong (2014) reported a mean profit efficiency of 68.7% while Yevu and Onumah (2021) reported an average profit efficiency score of 54.23 among layer producers in Brong-Ahafo and Greater Accra regions. In maize farms however, Wongnaa et al. (2019) reported a profit efficiency score of 45.9% among maize farmers in four ecological zones of Ghana.

The results in Figure 5 also reveal that between 0% and 10% score of profit efficiency there were 4.70% of broiler producers whose scores fell within that range which was also the lowest range, and the highest range was 91% to 100% in which 17% of broiler producers in the study area profit efficiency scores were found. The 91% to 100% range and 51% to 60% both had 17% each of respondents profit efficiency scores falling within that range. The range 11% to 20% had only 1.80% of broiler producers profit scores within it that was the range with fewer broiler producers in the study area. In all 41% of the broiler producers profit efficiency scores were between 71% and 100%, this is well above the average of 62.9% in the study area. This implies an above average proficiency among broiler producers in the study area.

Determinants of Profit Inefficiency Among Broiler Farms in Three Major Poultry Producing Regions of Ghana

The results in Table 43 show the predictors of profit inefficiency in broiler farms in the study area.

Table 43: Determinants of Profit Inefficiency in Broiler Farms for Three Major Poultry Producing Regions of Ghana

Inefficiency	Coefficient	Standard Error
Intercept	-2.763***	0.964
Age of broiler producer	0.011	0.0103
Formal education level	-0.389**	0.171
Membership of Poultry farmers' association	-0.205	0.323
Sex (male =1, female = 0)	0.652	0.481
Family labour	1.62***	0.25
Ever access credit	-1.144***	0.322
Extension service [veterinary and animal husbandry services] (Number of contacts)	1.336***	0.517

*, **, and *** represent a significance level of 10%, 5%, and 1% respectively.
Source: Field survey, Tuoho (2022).

It must be understood that the maximum likelihood estimates of the profit inefficiency model are interpreted as positive coefficient, implying an increase in profit inefficiency whilst a negative coefficient means a decrease in profit inefficiency or an increase in profit efficiency (Yevu & Onumah, 2021). These are the predicted variables, the attainment of formal education level, family labour, ever accessing credit and number of contacts to extension service (veterinary and animal husbandry services). These were all statistically significant at 1% and, therefore, explains why there is profit variation among broiler producers that participated in the study (Yevu & Onumah, 2021).

It is worth noting that among the variables in the inefficiency model, formal education level was statistically significant at 5% with a negative sign implying that it reduces inefficiency or increases the gross profit of broiler producers in the study area. Broiler production require the use of technology such as feed formulation, using the required ingredient mix and changing of the feed nutrient and ingredient mix for birds bi-weekly (thus chick starter feed, grower feed and finisher feed). It is plausible to say a producer with

formal education level would be able to carry all this out successfully, resulting in higher bird productivity. Hence, those broiler producers who have a formal education level would be able to increase their profit share more than those who did not. These findings corroborate with what has been reported among maize farmers in Ghana by Wongnaa et al. (2019) that formal education had a positive influence on their profit efficiency as it was found to be statistically significant at 1%. The implication of this was that educated farmers have higher profit efficiencies than illiterate ones.

Generally, broiler production is labour intensive for this reason the availability and cost of labour has always been a limiting factor for producers. Having and using family labour not only ensures labour availability but also provide in many cases cheap or free labour which impact positively on the cost of production. Therefore, to have family labour having a positive sign and being statistically significant at 1% is surprising. As it implies the use of family labour by broiler producers makes their businesses profit inefficient or unprofitable. But this may be plausible as some family members working on the broiler farm may pilfer birds and other production inputs knowing that they cannot be sacked from the work because of the family relationship or even failing to be diligent with their work which may result in bird mortality or reduction in the productivity of birds.

Additionally, ever access credit (have accessed credit before) aside being statistically significant at 1% was also negative implying it also reduces profit inefficiency or increases the gross profit of broiler producers in the study area. This may be so as availability of credit would increase the purchasing power of broiler producers enabling them to buy all necessary

production inputs for application at the right time to ensure higher bird productivity. This finding agrees with what has been reported by Tuffour and Oppong (2014) who found the coefficient of the access to credit variable to have a negative sign and statistically significant at 1%. Implying that broiler producers that can access credit produce in a more economically efficient manner than those who did not have access to credit. Similarly, Wongnaa et al. (2019) also reported that access to farm credit was positively related to profit efficiency and was significant at 1% which indicated the occurrence of higher profit efficiency for maize farmers that received credit.

Number of contacts to extension service (veterinary and animal husbandry services) was also significant at 1% and positive, this implies that it contributes to profit inefficiency or reduce the profit levels of broiler producers in the study area. This finding runs counter to what has been reported by Tuffour and Oppong (2014), Yevu and Onumah (2021) and Wongnaa et al. (2019) among broiler, layer, and maize producers respectively. It may be due to the number of contacts the broiler producers had with the extension service (veterinary and animal husbandry services) which probably because is inadequate or absent. Since in this same studies only 44.4% of broiler producers indicated they have working relationship with the veterinary services while 19.0% indicated have a working relationship with the animal production department.

Estimates of Profit Efficiency in Live Bird Markets for Three Major Poultry Producing Regions of Ghana

Table 44 presents the results of the maximum likelihood estimates of profit efficiency of live bird marketers in three major poultry producing regions of Ghana.

Table 44: Estimates of Profit Efficiency in Live Bird Markets for Three Major Poultry Producing Regions of Ghana

Variable	Coefficient	Standard Error
Intercept	-86.772***	2.104
lnBirds	58.464***	0.887
lnLabour	11.168***	1.463
lnCOB (Othercost)	-2.501***	2.654
0.5lnLabourlnLabour	1.802***	0.247
0.5lnCOBlnCOB	1.397**	0.596
0.5lnBirdslnBirds	-17.718***	0.317
lnLabourlnCOB	-1.833***	0.32
lnBirdslnCOB	5.831***	0.750
lnBirdslnLabour	-2.303***	0.399
Diagnostic statistics		
Sigma square	0.046***	
Gamma	1.000***	
Log-likelihood value	7.128	
Likelihood ratio test (with Cobb-Douglas)	40.196***	
Mean efficiency	0.344	

*, **, and *** represent a significance level of 10%, 5%, and 1% respectively.
Source: Field survey, Tuoho (2022).

The results in Table 44 are parameters generated through the stochastic frontier model. The maximum likelihood estimates of profit efficiency was jointly estimated with the profit inefficiency. The choice of Translog profit function model was adduce from empirical evidence following a simultaneous subjection of the Cobb-Douglas production function and the Translog profit function to a log-likelihood ratio test to ascertain which model best fit the data set from the study area. The results of the log-likelihood ratio test show a higher value of 7.128 for the Translog profit function and a lower value of -35.814 for the Cobb-Douglas production function (see results in appendix I).

In view of the foregoing, the Translog profit function model was found to be fit for the data and robust enough to estimate the maximum likelihood of profit efficiency of live bird sellers in the three study regions. Also, the wald chi-square statistic of the Translog function was 85.884 and statistically significant at 1%, implying joint significance of the model (Wongnaa et al., 2019). The estimated sigma square (σ^2) value from the Translog profit function was 0.046 and statistically significant at 1% alpha level, indicating a good fit for the model and that there is an inefficiency component in the model. Similarly, the gamma (γ) estimate was 1.000 and statistically significant at 1% alpha level. The gamma estimates shows that it was only the inefficiency effects that was important in explaining deviations from the stochastic profit frontier. Hence, all the error terms are explained by the inefficiency effect (Yevu & Onumah, 2021).

The stochastic profit frontier analysis of live bird sellers or marketers profit efficiency by the Translog profit function shows that all the variables were statistically significant. The cost of birds was positive and significant at 1%. This indicates a positive relationship between the cost of live bird and the profitability of live bird marketing. This implies that the cost of birds increases the profit efficiency in live bird marketing. If live bird marketers sell the birds well above the price, they bought it from broiler producers to consumers (price consumers pay for the bird) they would earn a higher gross profit. The finding concurs with Ayieko et al. (2014) who reported in their study of the efficiency of indigenous chicken marketing channels in the Makueni County of Kenya that the coefficient of the price paid by the consumer for live birds purchased had a positive effect on the marketing efficiency of live bird marketers and

was significant at 1%. Which imply that an increase in the consumer price by Ksh 1 would lead to an increase in the marketing efficiency by 4%.

The results in Table 44 also reveal that cost of labour was also statistically significant at 1% with a positive relationship with gross profit. It can be inferred that the cost of labour increases the profit efficiency in the marketing of live birds or makes live birds marketing profitable. This implies that hiring labour for live bird's sellers who hire and pay workers for their business were more profit efficient. This result disagrees with what has been reported among broiler producers in the Greater Accra region by Dziwornu and Sarpong (2014) that the coefficients of wage rate for hired and family labour were both negative and significant at 1%. An indication that the wage rate of hired and family labour was adversely affecting the profits of small-scale broiler producers.

Similarly, the profit elasticity of wage rate (both hired and family) was found to have a negative and significant relationship with the gross profit of layer producers in Greater Accra and Brong-Ahafo regions as such decreased gross profit of the producers in the study areas (Yevu & Onumah, 2021). Additionally, Wongnaa et al. (2019) have also reported a negative relationship between the price of labour and gross profit of maize farmers, as price of labour was found to be significant at 1%. Given the magnitude of the elasticity an increase in wage rate by 1% will lead to a decline in the profitability of maize farmers by 6.281%.

However, the coefficient of other cost was negative and statistically significant at 1%. This implies that other cost makes live bird marketing business profit inefficient or unprofitable. This is in agreement with Dziwornu

and Sarpong (2014) who found that other cost was negative and significant at 1% among small scale broiler producers in the Greater Accra region. Similarly, Yevu and Onumah (2021) also reported a negative coefficient of other cost which was also significant at 1% among layer producers.

Among the variables that were interacting 0.5lnCOBlnCOB was statistically significant at 5% with a positive relationship with gross profit. Similarly, the coefficient of the variables 0.5lnLabourlnLabour and lnBirdslnCOB were also significant at 1% but with a positive relationship with gross profit. Whereas the coefficient of variables lnCOB (Othercost), 0.5lnBirdslnBirds, lnLabourlnCOB and lnBirdslnLabour were also statistically significant at 1% but has a negative relationship with gross profit.

Distribution of Estimated Profit Efficiency Scores Among Live Bird Sellers in Three Major Poultry Producing Regions of Ghana

The distribution of the profit efficiency scores among live bird marketing businesses is presented in Figure 6. The results in Figure 6 reveals that the minimum profit efficiency for live bird sellers was 10.2% and the maximum score was 99.9%. While the mean (average) score of profit efficiency was 34.4% for live bird sellers in the study area. The results also show a very wide variation of profit efficiency among live bird sellers who were studied. As observed by Yevu and Onumah (2021) it may be due to inefficient allocation and use of inputs among the live bird sellers.

The mean profit efficiency score for the area was 34.4%, this implies that live bird sellers in the three study regions have the scope of increasing their profit by 65.6% through adopting and using the marketing and management techniques of the most efficient live bird seller in the study area.

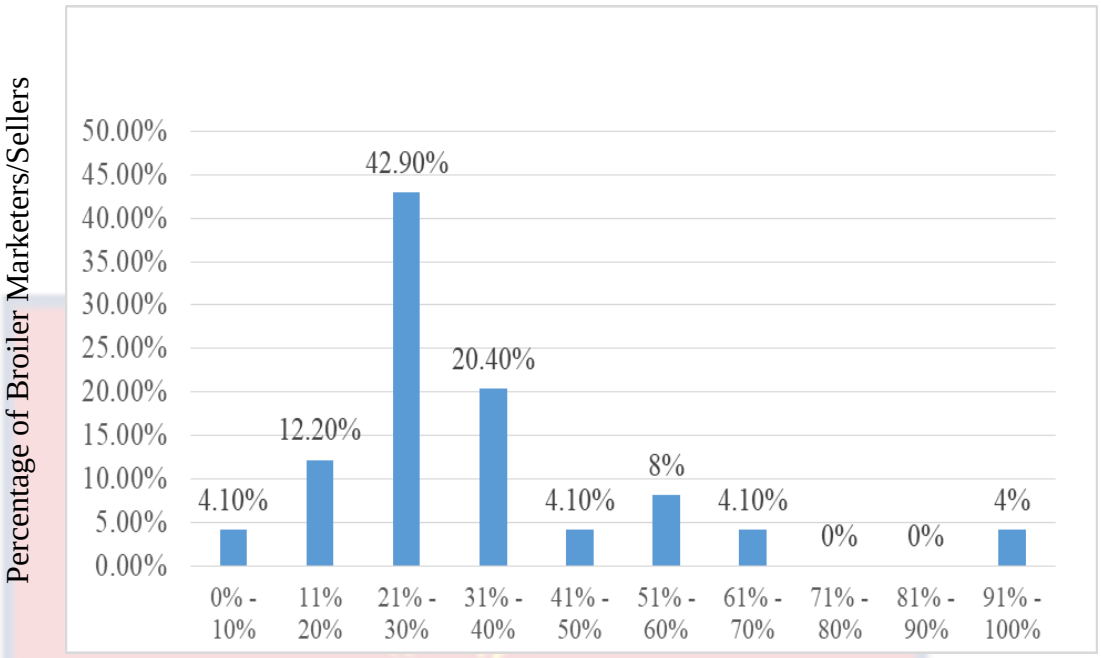

Figure 6: Distribution of Estimated Profit Efficiency Scores of Live Bird Sellers

It was noticed that for the range of 0% to 10, 41% to 50%, 61% to 70% and 91% to 100% all have 4.10% each of the live bird sellers profit efficiency score falling within these range. However, no live bird seller profit efficiency score fell within the range of 71% to 80% and 81% to 90% respectively. The majority (42.9%) of live bird sellers had their profit efficiency falling within the range of 21% to 30%. This implies that profit efficiency scores of live bird sellers studied are generally low.

Determinants of Profit Inefficiency in Live Bird Markets for Three Major Poultry Producing Regions of Ghana

Table 45 presents the factors that explain profit efficiency variations among live bird sellers that were studied.

Table 45: Determinants of Profit Inefficiency of Live Markets for Three Major Poultry Producing Regions of Ghana

Inefficiency	Coefficient	Standard Error
Intercept	-0.232	0.399
Sex (male =1, female = 0)	-0.853***	0.206
Age	0.016***	4.1898e-03
Educational level	0.333***	0.125
Ever access credit	1.088***	0.236
Household size	0.014**	5.9159e-03

*, **, and *** represent a significance level of 10%, 5%, and 1% respectively.
Source: Field survey, Tuoho (2022).

In this context, the maximum likelihood estimates of the profit inefficiency model results are interpreted as positive coefficient implying an increase in profit inefficiency whilst a negative coefficient means a decrease in profit inefficiency or an increase in profit efficiency (Yevu & Onumah, 2021). All the variables (sex, age, educational level, ever access credit and household size) that explain the profit efficiency variation were statistically significant albeit at different alpha levels.

The results reveal that the coefficient for sex (male =1, female = 0) was negative and statistically significant at 1%. It implies that being a male live bird seller reduces profit inefficiency as such increases profit efficiency or gross profit whereas being a female live bird seller results in increased profit inefficiency, hence a reduction in profit efficiency or gross profit. This may be due to the nature of the business that require a lot of traveling to rural areas to buy the birds from producers to come and sell, which is not only time consuming but labour intensive and females may not be able to dedicate all their time to this process. As such may sublet other activities such as loading and off-loading birds or even going to the villages to look for the birds to buy to others for a fee from their share of the gross profit, hence the increase in

profit inefficiency. In layer producing farms, Yevu and Onumah (2021) reported that male layer producers were more profit efficient than their female counterparts. According to the authors, results from their inefficiency model reveals a negative sign for gender, which was statistically significant at 1%. They also adduce the reason for the results to be due to male producers' ability to devote most of their time working on the farm and having the physical strength more than their female counterparts to work on the farms.

However, the coefficient of age was positive and statistically significant at 1%. This means that as live birds sellers increase in age, they also reduce in their ability to be profit efficiency in the business, making them more profit inefficient and consequently their businesses unprofitable. This result agrees with an earlier report by Dziwornu and Sarpong (2014), and Yevu and Onumah (2021).

Similarly, educational level had a positive coefficient and statistically significant at 1%. Implying that the more educated a live bird seller, the less profit efficient he or she becomes, making the live bird selling business unprofitable. This finding contradicts what has been reported by Wongnaa et al. (2019) who found years of schooling by maize farmers to have a negative coefficient and statistically significant at 1%.

Additionally, ever accessing credit was also found to have a positive coefficient and statistically significant at 1%. This indicates that live bird sellers who have ever accessed credit were less profit efficient and their businesses are characterised by reduced profitability compared to those who never had credit. It could be due to the repayment of the credit, which probably was contracted at a higher interest rate. However, Dziwornu and

Sarpong (2014) and Wongnaa et al. (2019) found that credit access rather reduced profit inefficiency among broiler and maize farmers respectively. Both authors found access to credit to be significant at 1% with a negative coefficient.

Also, household size had positive coefficient and statistically significant at 5%. This suggest that live bird sellers with larger household size are more profit inefficient compared to those with smaller household sizes. This may be due to live bird sellers using part of their gross profit or capital to take care of members of their households and since they are many it could draw down their gross profit compared to those with smaller household sizes.

Estimates of Profit Efficiency in Poultry Processing for Three Major Poultry Producing Regions of Ghana

The maximum likelihood estimates of stochastic frontier profit function model was carried out to predict the determinants of profit efficiency in poultry processing for three important poultry producing regions of Ghana and the results presented in Table 46.

Table 46: Estimates of Profit Efficiency in Poultry Processing for Three Major Poultry Producing Regions of Ghana

Variable	Coefficient	Standard Error
Intercept	-29.815***	0.892
lnBirds	19.481***	0.490
lnCOB (othercost)	-6.181***	0.887
0.5 lnCOBlnCOB	-0.429***	0.160
0.5 lnBirdslnBirds	-5.669***	0.149
lnBirdslnCOB	1.757***	0.269
Diagnostic statistics		
Sigma square	0.031***	
Gamma	1.000***	
Log-likelihood value	63.397	
Likelihood ratio test (with Cobb-Douglas)	124.27***	
Mean efficiency	0.799	

*, **, and *** represent a significance level of 10%, 5%, and 1% respectively.
Source: Field survey, Tuoho (2022).

In determining which prediction model to use the Cobb-Douglas production function and the Translog profit function were jointly subjected to a log-likelihood ratio test. The results show that Cobb-Douglas production function had a value of 1.263 (see appendix J) while the Translog functions had a log-likelihood ratio test value of 63.397.

This demonstrates that the Translog profit function was more flexible than the Cobb- Douglas production function and fits poultry processing activities in the study area. Hence, the ability of the Translog profit function to estimate profit efficiency among poultry processors (Wongnaa et al., 2019). To this end, the Translog profit function model was chosen over the Cobb-Douglas production function, since it had a larger log-likelihood ratio test value compared to Cobb-Douglas production function.

Also, the results in Table 46 show that the wald chi-square statistic of the Translog profit function was 124.27 and statistically significant at 1%, this implies a joint significance of the model (Wongnaa et al., 2019). Whereas the sigma square (σ^2) value of 0.031was statistically significant at 1% an indication of a good fit and correctness of the specified distributional assumption (Wongnaa et al., 2019). The estimate for gamma (γ) was 1.000 and was also significant at 1%, which implies that the profit inefficiency effects are significant in determining the level and variability of poultry processing businesses profit in the three study regions. As such the observed variations in profit efficiency among poultry processors are the result of differences in processing practices and characteristics of the respondents rather than random factors (Yevu & Onumah, 2021).

The results in Table 46 reveal that all the predicting variables of profit efficiency among poultry processors in the study area were statistically significant. The coefficient of the variable cost of bird was positive and statistically significant at 1%. This means that the cost of bird increases processors profit efficiency, hence makes the processor earn more gross profit. This indicates that a processor who sell processed birds well above the cost at which the live bird was bought and the cost of processing will earn a higher gross profit. Similarly, a study that analysed the value-added activities of the pineapple value chain in Central region of Ghana found the cost of pineapple fruits used by pineapple processors in their processing business to influence their profit. The coefficient of the cost of the fruits was significant at 1% and positively influenced gross profit (Boakye, 2020).

However, the variable other cost was found to be negative and statistically significant at 1%. This implies that other cost has a negative relationship with gross profit. This is in synch with the report of Dziwornu and Sarpong (2014), and Yevu and Onumah, (2021). They both found other cost to have negative relationship with gross profit as the coefficient was negative and significant at 1%.

Relatedly, interacting variables lnCOBlnCOB and lnBirdslnBirds were both negative and statistically significant at 1% by implication both have a negative relationship with profit, as such decreases the gross profit of the poultry processor. This notwithstanding, the coefficient of the interacting variable lnBirdslnCOB was positive and statistically significant at 1%, hence increases the gross profit of poultry processors.

Distribution of Estimated Profit Efficiency Scores of Poultry Possessors

The distribution of the profit efficiency scores is presented in Figure 7, the results show that the minimum profit efficiency score was 33.3% while the maximum score stood at 99.2% and the mean (average) was 79.9%. A mean profit efficiency score of 79.9% is very high and may share some light on the conclusions of Etuah et al. (2021) that poultry processing businesses in Ghana were profitable. The mean profit efficiency score of 79.9% also stand out as significant among related studies in other areas of agricultural value chains reported by Dziwornu and Sarpong (2014), and Yevu and Onumah, (2021), and Wongnaa et al. (2019).

The mean profit efficiency of 79.9% implies that on average a poultry processor can achieve optimal profit efficiency, in the short run by increasing their profits by 20.1% through the adoption of best practices in poultry processing that are allocative efficient (Yevu & Onumah, 2021).

This aside, the results in Figure 7, also reveals that profit efficiency scores were distributed among poultry processors in three of the ranges; 21% to 40% in which 12% of poultry processors fell within, similarly 41% to 60% also with 12% scores of poultry processors and 81% to 100% range which constitute 76% of the poultry processors. This means majority of the processors were operating well above the mean profit efficiency.

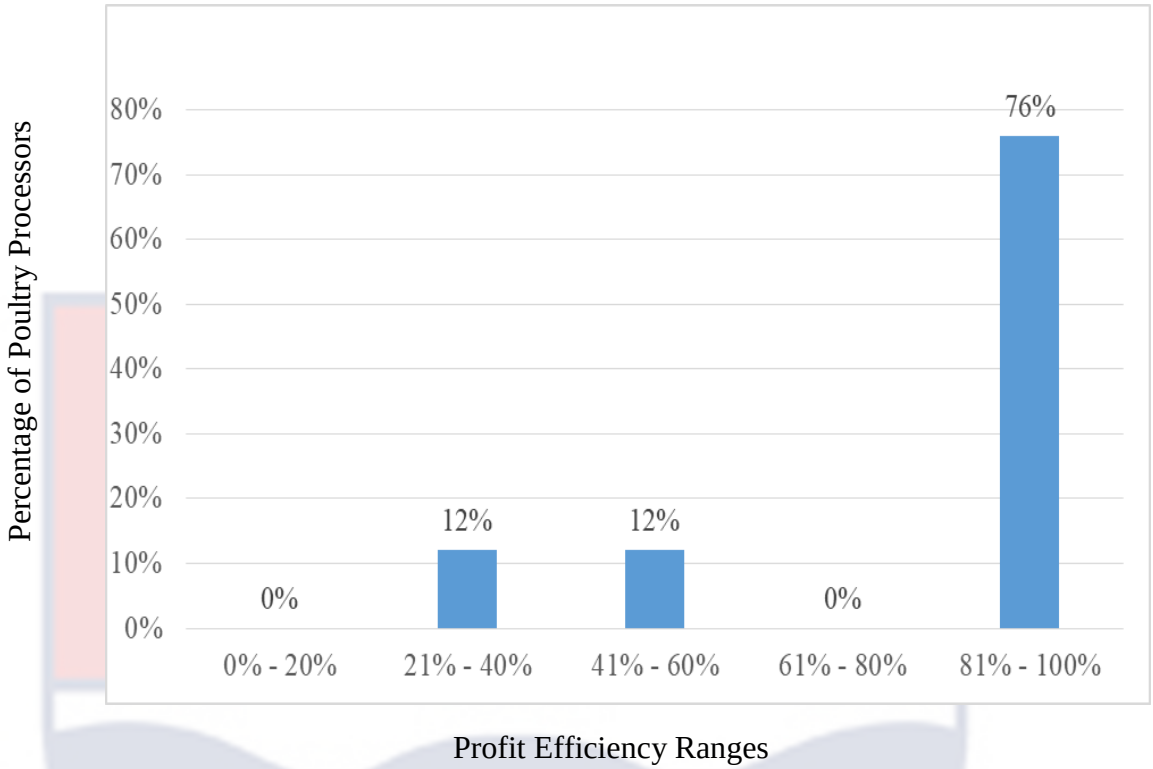

Figure 7: Distribution of Estimated Profit Efficiency Scores of Poultry Possessors

However, for the range of 0% to 20% and 61% to 80% no poultry processor profit efficiency scores fell within that.

Determinants of Profit Inefficiency in Poultry Processing for Three Major Poultry Producing Regions of Ghana

Table 47 presents predicting variables of inefficiency in poultry processing businesses in the three study regions.

Table 47: Estimates of Profit Inefficiency in Poultry Processing for Three Major Poultry Producing Regions of Ghana

Inefficiency	Coefficient	Standard Error
Intercept	0.443	0.666
Age	-0.073***	0.007
Level of Education	0.698***	0.148
Processors Association	-0.005	0.196
Ever access credit	-0.52***	0.172
Household size	0.405***	0.084

, **, and * represent a significance level of 10%, 5%, and 1% respectively*.
Source: Field survey, Tuoho (2022).

The maximum likelihood estimates of the variables that predicts profit inefficiency in the model. Are explained, to mean variables with a positive coefficient, increases profit inefficiency whilst those with a negative coefficient decreases profit inefficiency or increases profit efficiency (Yevu & Onumah, 2021).

The results in Table 47, reveal that four of the predicting variables (age, level of education, ever access credit and household size) were all statistically significant. The coefficient of the variable age was negative and statistically significant at 1%. This implies that age has a negative relationship with profit inefficiency. As poultry processors increase in age their profit inefficiency in processing business reduces. This finding contradicts what has been reported by Dziwornu and Sarpong (2014) in which younger broiler producers were found to be more efficient that older broiler producers, while Yevu and Onumah, (2021) found age to have a positive relationship with profit inefficiency and significant at 5% among layer producers in Ghana implying aged producers of layers were less proficient efficient compared to younger layer producers.

On the contrary, the coefficient of the level of education was positive and statistically significant at 1%. This indicates that the higher the education level of a processor the less profit efficient his or her poultry processing business becomes, in essence the higher the educational level of a processors the higher the profit inefficiency of the business. However, Wongnaa et al. (2019) found in their study on maize farmers that years of schooling had a negative relationship with profit inefficiency and the coefficient was significant at 1%. While Yevu and Onumah, (2021) also reported a negative

relationship between profit inefficiency and training in poultry farming as the coefficient was negative and statistically significant at 1%.

Ever accessed credit had a negative coefficient and statistically significant at 1%. This implies that poultry processors who had access to credit before, record higher profits as they can reduce inefficiencies in their business compared to those who had no access to credit. The credit accessed by the processors might have helped them buy inputs to increase the scale and reach to customers. This finding is consistent with what has been reported by Dziwornu and Sarpong (2014), and Wongnaa et al. (2019) among broiler producers and maize farmers. The authors both found in their studies a negative relationship between access to credit and profit inefficiency and a coefficient that was significant at 1%.

The results also revealed that the coefficient of household size was positive and statistically significant at 1%. Hence, poultry processors who are from larger households are more profit inefficient than those poultry processors from households with smaller family sizes. Although, Wongnaa et al. (2019) reported a negative relationship between size of household and profit inefficiency, the coefficient of the variable did not show statistical significance.

Examining the Perceived Knowledge Level and Perception of Ghanaian Tertiary Students towards Choosing Broiler Value Chain Business as a Vocation

The objective four (4) of the study was aimed to measure the perception of students [youth] (undergraduate final year university students) at UCC, KNUST, UENR, and AAMUSTED towards choosing broiler value

chain business as a vocation after graduation. To accomplish this objective, a two-prong approach was adapted to first assess the perceived knowledge level of undergraduate final year students in broiler value chain activities before examining their perception toward engaging in the chain activities. The results under various topics are discussed in the section following this introductory review.

Demographic and Socio-Economic Characteristics of Students

The demographic and socioeconomic characteristics of students (UCC, KNUST, UENR, and AAMUSTED) are presented in Table 48, Figure 8, 9, and 10. The results presented in Table 48, indicates that the majority of students interviewed were males (male = 74%, female =26%) with an average age of 24 years (mean = 24.12, Std. =2.76) and comes from a family with a household size of 6 (mean = 6.21, Std. = 2.86). Most of the students were not married (not married = 92.1%, married = 7.8%).

Table 48: Demographic Characteristics of Students

Variable	**Statistic**	
	Mean	**Std. Deviation**
Age of respondent	24.12	2.76
Household size	6.21	2.86
Sex	**Frequency**	**Percent**
Male	539	74
Female	189	26
Marital status	**Frequency**	**Percent**
Single	671	92.1
Married	58	7.8
Have you been taught poultry production	**Frequency**	**Percent**
Yes	666	91.48
No	62	8.52
Where do parents live	**Frequency**	**Percent**
Uurban	440	60.5
Rural	288	39.6
Parents are farmers	**Frequency**	**Percent**
No	467	64.1
Yes	261	35.9
Are parents poultry farmers?	**Frequency**	**Percent**
No	596	81.9
Yes	132	18.1

Source: Field survey, Tuoho (2022)

Several studies have reported that sex (gender) was a significant variable that impact on the entrepreneurial intentions of students (Westhead & Solesvik, 2016; Wilson et al., 2007), although Shinaar et al. (2017) disagree. However, Westhead and Solesvik (2016) and Wilson et al. (2007) both reported that males were more likely to have a positive entrepreneurial intention than females.

Similarly, age also have implications on the entrepreneurial intensions of individuals, Agbim et al. (2013) observed that entrepreneurial intention of people increases with age. This implies that the age of a graduate at the time of leaving school could influence their entrepreneurial intention with a higher desire for entrepreneurship among older students than younger ones.

On the occupation of their parents, 35.9% of them were farmers with 18.1% being poultry farmers. Also, majority (60.5%) of the students had their parents living in urban areas.

Types of Agricultural Related Programmes Studied by Students

Among the 728 respondents, 91.48% of them were taught poultry production in the course of their university education. The agriculture and agricultural related programmes studied by students in the four public universities were Agribusiness, Agricultural Extension, Agricultural Economics, Animal Science, Crop Science, Agricultural Biotechnology and Agro processing. The speciality of some of the universities made some programmes to have slight change of names, this notwithstanding, those programmes were combined with the traditional known names for the analysis. These programmes include animal science education, which was added to animal science, agricultural economics education which was added to

agricultural economics and agricultural extension education which was also added to agricultural extension. Similarly, community development studies was also added to agricultural extension. Whiles horticulture and crop science, and crops and soil science education were all added to crop science. The percentages of students per programme is presented in Figure 8.

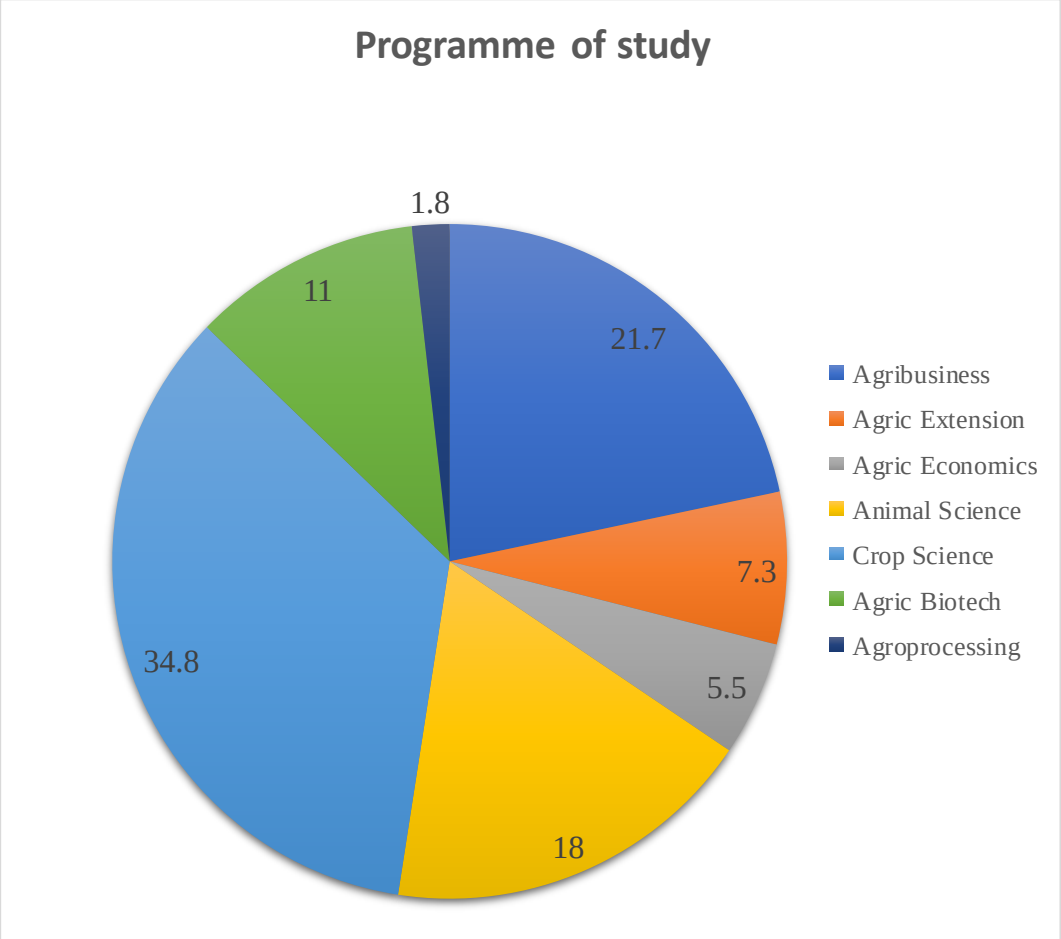

Figure 8: Students programmes of study

From the Figure 8 shows that, 34.8% of the students had a crop science specialization although they have taken a course in poultry production prior to their specialization in final year. Also 21.7%, 18% and 5.5% of the students were pursuing a programme in agribusiness, animal science and agricultural economics respectively. With 7.3% specializing in agricultural extension while 11% were agricultural biotechnology students. Only 1.8% of the

students were pursuing an agro-processing programme. The type of programmes offered is critical in determine the type of knowledge and skill set a student build for future endeavours. For instance, studies by Salvago et al. (2019) demonstrated that one of the reasons young farmers entered livestock production as a vocation in Thailand, was because they have the knowledge and skills. This has been collaborated by Anyidoho et al. (2012) in a study on the aspiration of rural youth in Ghana's cocoa sector that having the required skills was critical for the participation of the youth in the agrifood food chain.

The Occupation of Parents of Students

The results show that, the main occupation of the parents of students include farming (crops/animals), construction work, and trading/commerce. The rest are public or civil servant, and formal private sector employment. The details are presented in Figure 9.

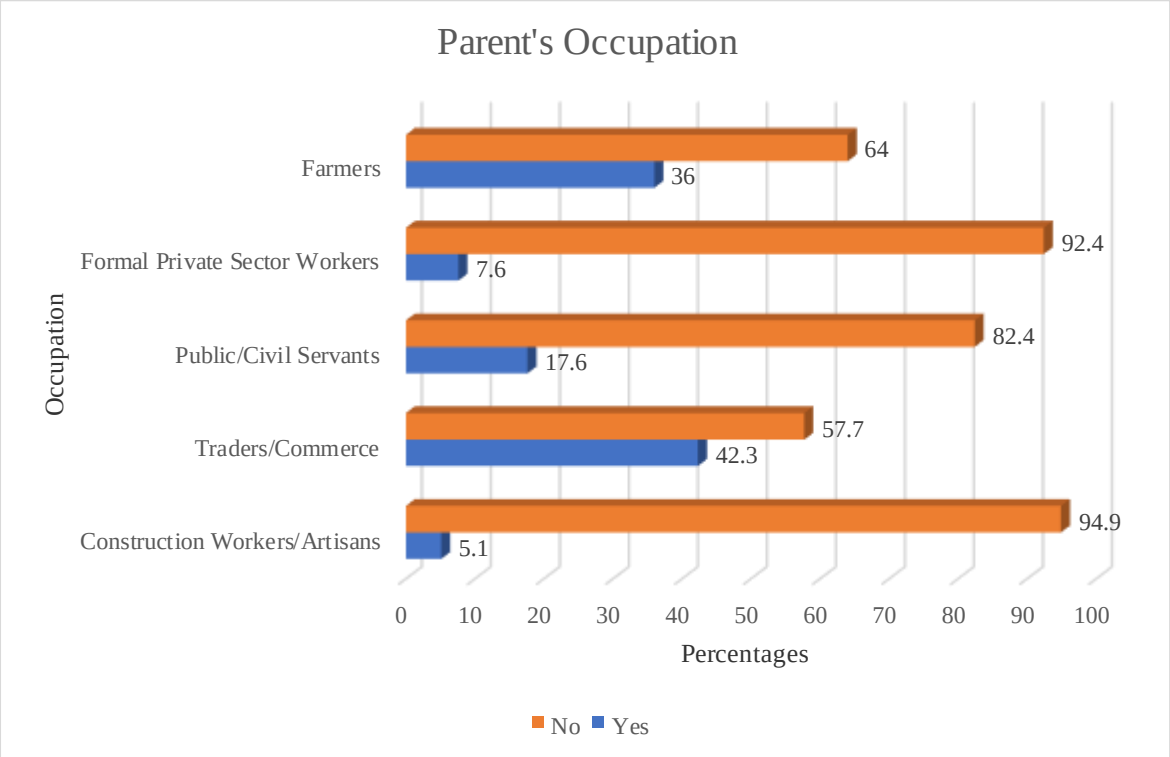

Figure 9: Occupation of parents of students

Most (42.3%) of the parents of students were into trading and commerce, this includes wholesaling and retailing of a wide range of products from agricultural produce to cosmetics and clothes. Also, a significant number of the students had parents who were public sector workers, this was 17.6% of the entire sample interviewed while only 7.6% had parents who were employed in the formal private sector with the least (5.1%) being construction workers or artisans whiles 36% were engaged in farming.

The parents of students who were into farming and the rearing of livestock, were into the production of the following livestock species; poultry, pigs, cattle, and small ruminants. The details of the various livestock reared by the parents of students are presented in Figure 10.

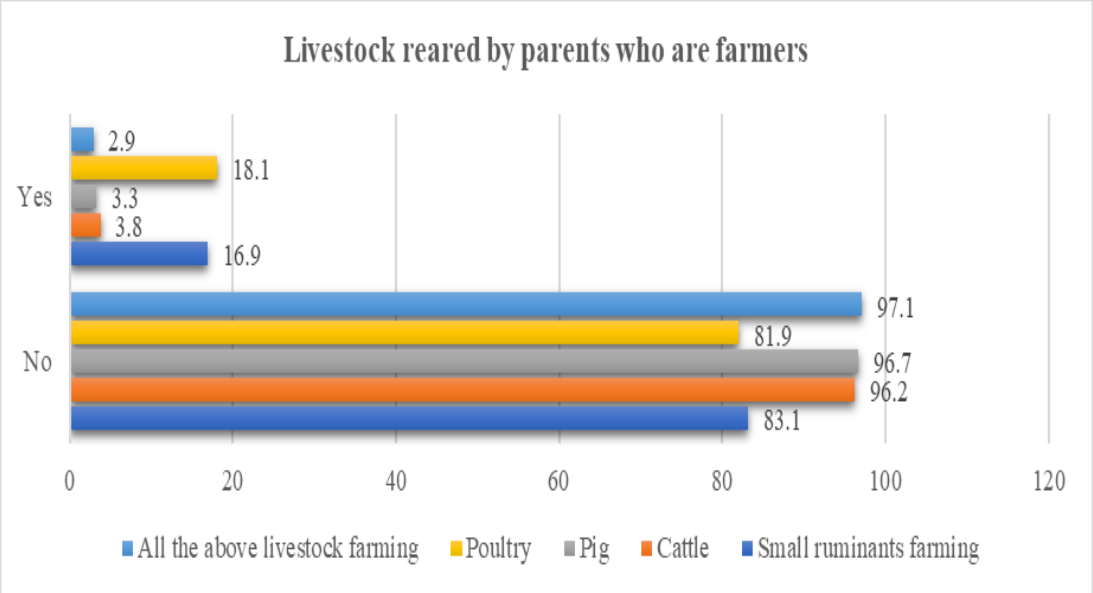

Figure 10: Type of Livestock Reared by Parents Who are Farmers

From Figure 10, 16.6% of the students have parents who are into small ruminant rearing while 3.8%, 3.3% and 2.9% have their parents' rearing cattle, pigs (swine) and all the above livestock respectively. This implies that aside poultry production a student on the average has parents who are into production of small ruminants (goats and sheep). The occupation of parents

particularly in agriculture related business has been reported to either encourage or discourage their children in taking-up agriculture as a vocation (Mabe et al., 2020; Góngora, et al. (2019).

Aside the occupation of parents of students, some students were also engaged in selected economic activities alongside schooling. The details are presented in Figure 11.

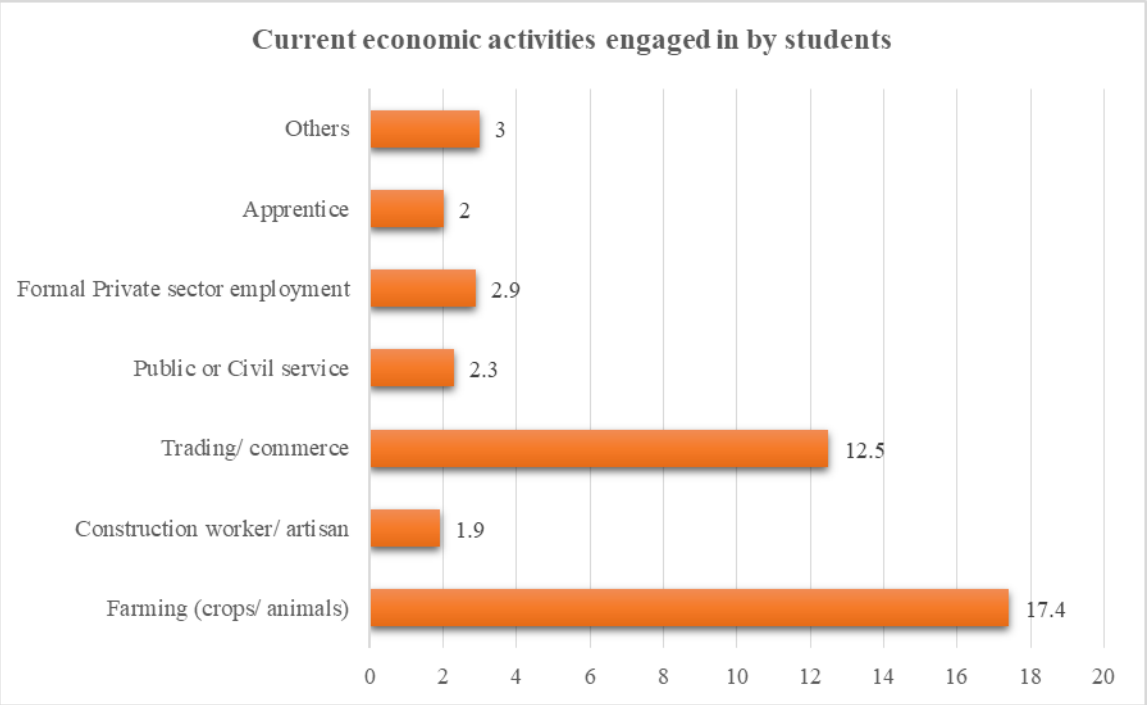

Figure 11: Current Economic Activities Engaged in by Students

From the results in Figure 11, 17.4% of the students were engaged in crop farming, both arable crops and trees. The students do this alongside their studies, and this was encouraging, an indication that students pursuing agriculture and its related programmes are involved in a venture related to what they are studying in school or are having a practical experience in their field of studies. On the contrary, 12.5% of the students were engaged in trading or commerce alongside schooling. This includes the sale of sachet water, "sobolo" drink, yoghurt etc. at their hostels of residence. Indicating

how students are taking opportunity of the demand for these products around them alongside their academic work. Whiles, 2% of respondents were engaged in some form of apprenticeship programme, this initiative by these group of students would equip them with the required entrepreneurial and technical skills to start their own business after graduation irrespective of whether it relate to their field of study or not. There was also 2.9% and 2.3% of the students who were formal private sector workers and civil servants respectively.

Previous farming experience has been reported to drive youth away from engaging in cocoa farming in Ghana (Mabe et al., 2020). Similarly, Bosompem et al. (2017) also found that students whose parents live in rural areas and have been involved in farming not likely to take up agribusiness after graduation. Therefore, engaging in agricultural related activities or ventures while in school does not guarantee continuation in the agricultural activity after graduation.

Aside from the economic activities students were engaged in while schooling, respondents were also asked to describe their job aspiration after graduation, particularly for the next five years after school. The results of their responses are presented in Figure 12.

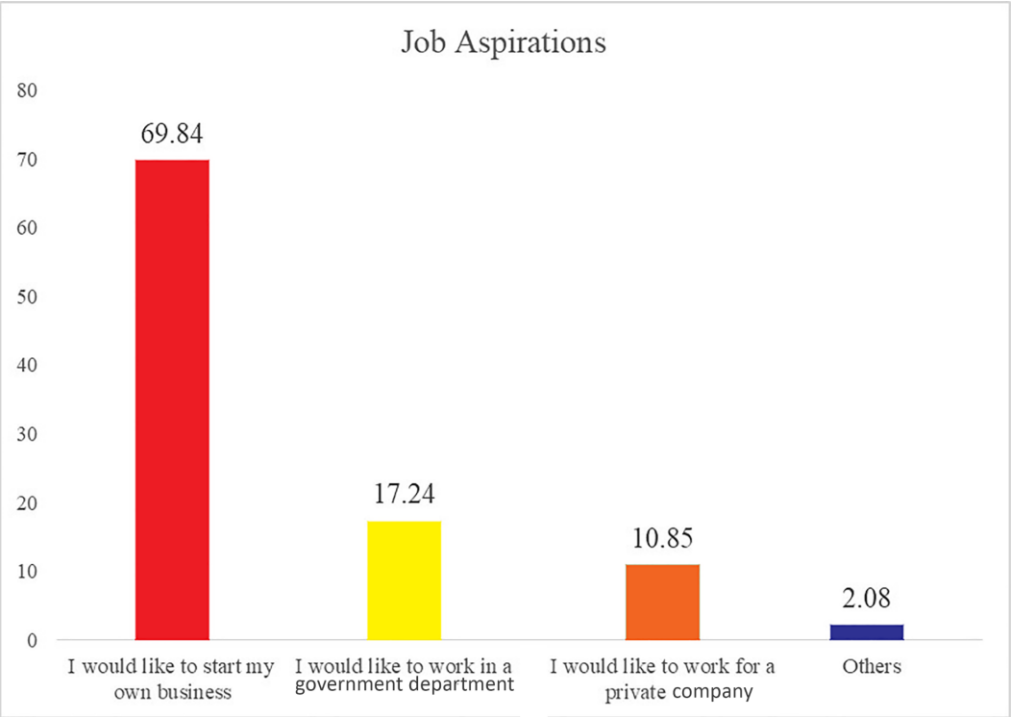

Figure 12: Job Aspiration of Students

According to the results presented in Figure 12, majority (68.84%) of the students interviewed were looking forward to starting their own businesses after school. This implies that most of the students interviewed would want to start their business after school. However, 17.24%, were looking forward to working in the public sector while 10.85% wanted to be employed in the private sector. Conversely, 2.08% of the students had other career aspirations which included, catering, music and the sale of clothing and fashion materials.

For the 68.84% of the students who want to start their own business after school. They were asked the type of business or enterprise their future business would be in, the results of this are presented in Figure 13.

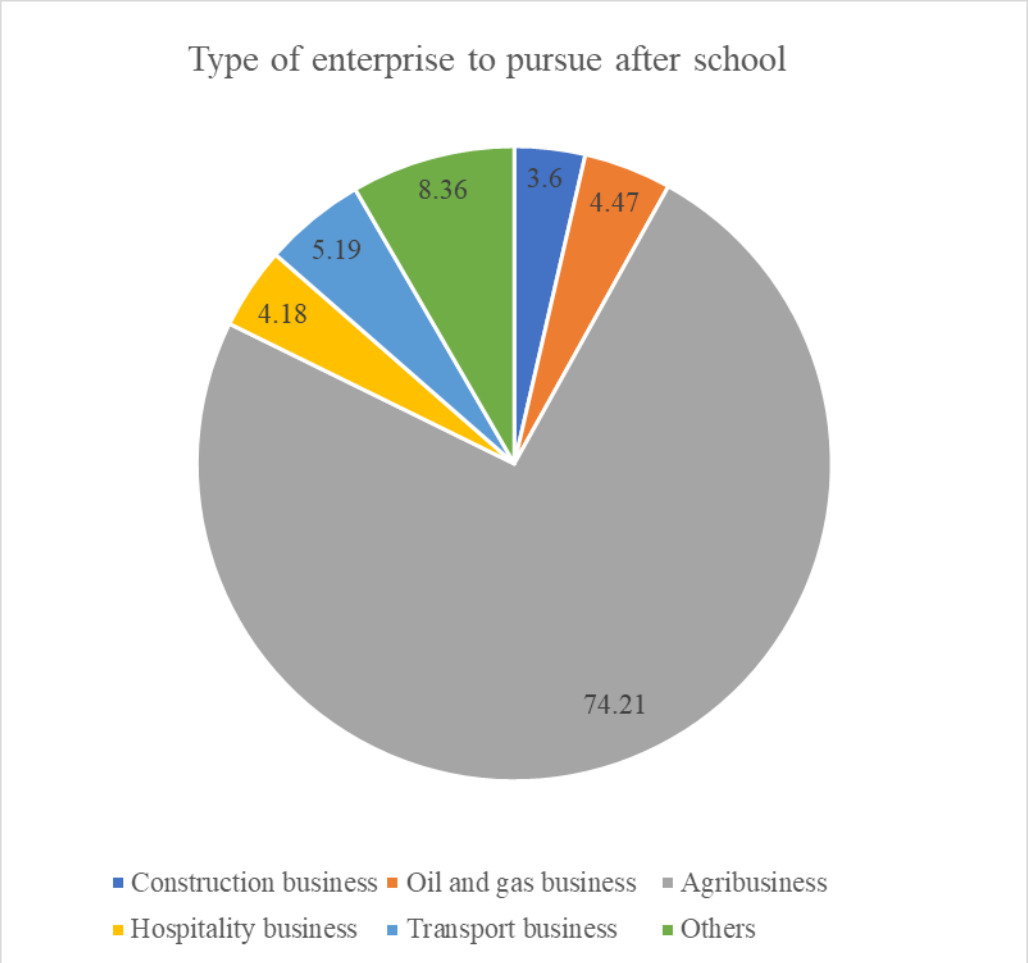

Figure 13: Enterprises Students Want to Pursue After School

The results from Figure 13, shows that 74.21% of the 68.4% of students interviewed who want to start their own businesses or enterprises want to venture into agribusiness. This suggest that most students pursuing agriculture and agriculture related programmes would want to set up an agribusiness venture after school. This finding is significant in that, it is consistent with what have been reported by Inegbedion and Islam (2020) in a study conducted in four universities in the Southwest of Nigeria which found the motivation of students studying agriculture to be borne out of the desire to acquire skills that would help them to be self-employed after graduation.

On the contrary, the remaining 25.79% of the students would want to venture into construction business, transport business, oil and gas business and hospitality business as well as music and fashion after school. This implies that they probably did not do prober consultation before choosing the programme of study, so while pursuing the programme and interacting with people they have discovered where their interest is. It is also worth noting that this 25.79% could be part of the students that the university admission system admitted them to pursue agriculture even though they did not choose that programme of study. There are some universities that allocate programmes of study to students once they fail to be selected for their programme of choice.

Examining the Perceived Knowledge Level of Undergraduate Final Year University Students in the Domestic Broiler Value Chain Activities

A four-point Likert-scale type questions with six constructs (inputs production and distribution, broiler production activities, broiler processing activities, marketing of broiler activities, waste management activities, and provision of support services) with statements was administered to study respondents. The six constructs were the specific activities undertaken along the domestic broiler value chain. Respondents were asked to self-assess their perceived knowledge level in the various activities along the domestic broiler value chain, either as having poor, good, very good or excellent knowledge. Table 28 contain results of the perceived knowledge level of students on the various activities of the domestic broiler value chain.

The results from Table 49 shows that, most students have good knowledge in feed milling (n=351, 53.6%) with only a few having excellent knowledge (n= 30, 4.65%). Also, it was revealed with a mean of 2.11, 2.07,

and 2.08 that students had good knowledge in feed manufacturing, importation and distribution of feed as well as local distribution of feed. This indicates that the average student has good knowledge on marketing and distribution of feed. The findings also revealed that 28.4% and 21.4% of the students had poor knowledge on feed ingredients importation and distributions as well as aggregation and distribution of local feed ingredients. However, on the average students had good knowledge in these activities having scored a mean of 2.04 and 2.14 respectively.

Table 49: Perceived Knowledge Level of Students on Broiler Value Chain Activities

Activity	Poor (1)	Good (2)	Very Good (3)	Excellent (4)	Mean	Std.
Inputs Production and Distribution						
Feed milling (toll feed processing)	104 (15.9)*	351 (53.6)	170 (26.0)	30 (4.6)	**2.19**	0.75
Feed manufacturing	139 (21.9)	321 (50.6)	140 (22.1)	34 (5.4)	**2.11**	0.80
Importation and distribution of feed (Marketing)	173 (26.7)	298 (46.0)	138 (21.3)	39 (6.0)	**2.07**	0.85
Local distribution of feed (Marketing)	154 (24.3)	308 (48.5)	139 (21.9)	34 (5.4)	**2.08**	0.82
Feed ingredients importation and distribution (Marketing)	184 (28.4)	289 (44.5)	140 (21.6)	36 (5.5)	**2.04**	0.85
Local feed ingredients aggregation and distribution (Marketing)	139 (21.4)	322 (49.6)	147 (22.7)	41 (6.3)	**2.14**	0.82
Veterinary drugs and vaccine importation and distribution (Marketing)	220 (33.4)	263 (40.0)	134 (20.4)	41 (6.3)	**2.00**	0.89
Local distribution of veterinary drugs and vaccines (Marketing)	247 (37.7)	279 (42.6)	110 (16.8)	19 (2.9)	**1.85**	0.80
Importation and distribution of fertile hatchable eggs (Marketing)	217 (33.2)	279 (42.7)	124 (19.0)	33 (5.1)	**1.96**	0.85

Table 49: Continue

Importation and distribution of day-old chicks	125 (19.2)	273 (41.9)	185 (28.4)	68 (10.4)	**2.30**	0.90
Hatching and distribution of day-old chicks locally	144 (22.4)	272 (42.4)	168 (26.2)	58 (9.0)	**2.22**	0.90
Operating a broiler parent stock/holding farm to produce locally fertile hatchable eggs	184 (28.5)	298 (46.2)	129 (20.0)	34 (5.3)	**2.02**	0.84
Overall Index					**2.08**	
Broiler Production Activities						
Brooding of broiler from week zero (0) to week four (4)	116 (17.8)	301 (46.3)	178 (27.4)	55 (8.5)	**2.26**	0.85
Raising broiler from week four (4) to week eight (8)	101 (15.6)	282 (43.7)	197 (30.5)	66 (10.2)	**2.35**	0.86
Raising broiler from week zero (0) to week eight (8)	109 (17.0)	274 (42.7)	187 (29.2)	71 (11.1)	**2.34**	0.89
Overall Index					**2.32**	
Broiler Processing Activities						
Whole dressing of birds	145 (22.3)	250 (38.4)	174 (26.8)	82 (12.6)	**2.34**	1.54
Dressing and cutting of birds into chicken parts	125 (19.3)	242 (56.7)	180 (27.8)	100 (15.5)	**2.39**	0.97
Overall Index					**2.37**	
Marketing of broiler Activities						
Live birds selling	92 (14.1)	249 (38.2)	195 (30.0)	115 (17.7)	**2.51**	0.94
Dressed whole or chicken cuts for sale (operating a cold store for locally produced broilers)	161 (24.9)	220 (34.0)	177 (27.4)	89 (13.8)	**2.3.0**	0.99
Overall Index					**2.41**	
Waste management Activities						
Converting broiler dropping into manure	156 (23.8)	219 (33.4)	158 (24.1)	122 (18.6)	**2.38**	1.04
Using broiler dropping to generate energy	398 (61.3)	141 (21.7)	76 (11.7)	34 (5.2)	**1.61**	0.89
Converting furthers and visceral from broiler processing to feed for other animals	353 (54.9)	181 (28.1)	87 (13.5)	22 (3.4)	**1.65**	0.84
Overall Index					**1.88**	
Provision of Support services						

Table 49: Continue

Construction of poultry houses	116 (17.8)	285 (43.8)	164 (25.2)	85 (13.1)	**2.34**	0.92
Local production/fabrication of lighting systems, egg, drinkers, feeders, etc.)	127 (19.4)	270 (41.3)	178 (27.3)	78 (11.9)	**2.32**	0.92
Importation and distribution of lighting systems, egg, drinkers, feeders, etc.)	241 (37.0)	265 (40.6)	108 (16.6)	38 (5.8)	**1.91**	0.87
Distribution of locally produced/fabricated, lighting systems, drinkers, feeders, etc.)	220 (33.7)	278 (42.6)	129 (19.8)	25 (3.8)	**1.94**	0.83
Communication-advertising of broiler production inputs and products	210 (32.2)	278 (42.6)	121 (18.6)	43 (6.6)	**2.00**	0.88
Provision of business development services to broiler value chain actors	235 (36.3)	249 (38.4)	128 (19.8)	36 (5.6)	**1.95**	0.88
Provision of animal husbandry and nutritional services (training & advisory)	187 (28.7)	282 (43.3)	133 (20.4)	49 (7.5)	**2.07**	0.89
Transportation of production inputs and products of the broiler value chain	184 (28.2)	281 (43.0)	143 (21.9)	45 (6.9)	**2.08**	0.88
Overall Index					**2.08**	

1 = Poor, 2 = Good, 3 = Very Good, and 4 = Excellent. * Figures in parenthesis are in percentages. Source: Field survey, Tuoho (2022).

Also, only 2.9% of students had excellent knowledge in veterinary drug and vaccine importation and distribution with the average student having good knowledge on that. With regards to importation and distribution of hactable eggs (n =297, 42.6%) and importation and distribution of day-old chicks (n =273, 41.9%), most students had good knowledge on these activities, however, very few of the students about 10% had excellent knowledge in importation and distribution of day-old chicks and hatching and distribution of day-old chicks locally. Overall, majority of the students interviewed in this

study had good knowledge (composite mean = 2.08) on input production and distribution activities along the broiler value chain.

However, students ranked their perceived knowledge level in broiler production activities, as follows 17.8%, 15.6% and 17.0% had poor knowledge on broiler production activities such as brooding of broiler from week 0 to week 4, raising broiler from week 4 to week 8 and raising broiler from week 0 to week 8 respectively. Nevertheless, 27.4%, 30.5% and 29.2% respectively had very good knowledge in these activities with the average student having good knowledge (composite mean = 2.32) on broiler production activities.

For broiler processing activities, 12.6% and 22.3% as well as 15.5% and 19.3% had excellent and poor knowledge respectively on dressing whole bird and cutting birds into chicken cuts. Generally, the students had good knowledge in these activities with a mean of 2.34 and 2.39 respectively. The composite mean for broiler processing activity was 2.37 (good).

An average student had very good knowledge in live bird selling (mean = 2.51) even though 14.1% of the students had poor knowledge on this activity. This score of very good knowledge in this activity may be because broilers produced in Ghana are sold as live birds (Amanor-Boadu et al., 2016). It was further revealed from the findings that only 13.8% of the students had excellent knowledge in operating a cold store facility for locally produced broilers. Furtherance to this, the activity recorded a mean score of 2.30 implying that on the average students had good knowledge on the activity.

On waste management activities, 23.8% and 18.6% of students had poor and excellent knowledge on converting broiler dropping into manure

while 33.4% and 24.1% had good and very good knowledge on the activity. This activity recorded a mean of 2.38, implying that most students had good knowledge on the activity. On the use of broiler droppings to generate energy considerable number of the students, 61.3%, had poor knowledge on generating electricity from broiler droppings while 5.2% had excellent knowledge on the activity. Also just like the previous activity discussed, on converting feathers and visceral from broiler processing to feed for other animals, 28.1% of the students had good knowledge whiles 54.9% had poor knowledge on it.

These two last activities, generating electricity from broiler droppings and converting feathers and visceral from broiler processing into feed for other animals, recorded the lowest means of 1.61 and 1.65 among the perceived knowledge statements indicating that although the average student has good knowledge in these activities' but generally, the knowledge level of students in waste management along the broiler value chain was not quite good.

On providing support services, on average students had good knowledge (43.8%). Although 17.8% of students had poor knowledge on how to construct a poultry house. Also, 11.9% had excellent knowledge in the local production of lighting systems, egg crates, drinkers, and feeders while the average student had good knowledge in carrying out this activity. However, on the importation and distribution of lighting systems, egg crates, drinkers, and feeders 37.0% had poor perceived knowledge level, while the remaining had good (41.3%), very good (16.6%) and excellent (5.8%) knowledge. Students had good knowledge (42.6%) in communication and advertising of broiler

production inputs and products, whereas for the same activity, 32.2% of the students recorded poor knowledge.

For the provision of business development services to broiler value chain actors, this activity recorded 36.3% of students having poor knowledge. Additionally, in the same activity of providing business development services only 5.6% of the students had excellent knowledge. The findings further showed that 28.7% and 38.2% had poor knowledge in the provision of animal husbandry practices and nutritional services, and transportation of production inputs and products of the broiler value chain respectively. A few of the students, 7.5% and 6.9%, had excellent knowledge level in these activities. However, students generally had good knowledge level (2.08) in the activity.

Overall, the results indicated that the average student had good perceived knowledge in performing activities on the domestic broiler value chain with an overall perceived knowledge index of 2.08. It was only on the activity of live birds selling that students ranked very good (2.51) perceived knowledge and using broiler dropping to generate energy which was also ranked the lowest (1.61). What can be concluded from this, is that students during their four-year degree programme in the university only take a course in mono gastric animal production of which poultry is part and is generally taught. Aside that they have no other course relating to poultry not even those specialising in animal science. This may explain the relatively low perceived knowledge ranking of activities along the domestic broiler value chain by students.

Perceived Knowledge Levels of Students in Broiler Value Chain Activities in Four Public Universities in Ghana

As part of assessing students' perceived knowledge level on the various broiler value chain activities, the composite perceived knowledge score per chain activity of each of the study University (UCC, KNUST, UENR, and AAMUSTED) was computed and compared with the others (See appendix K for the detail summary of means per university). The results of the composite means are presented in Table 50.

Table 50: Perceived knowledge levels of students in broiler value chain activities in four public universities in Ghana

Activity	UCC		KNUST		UNER		AMMUSTED	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Inputs Production and Distribution	2.22	0.74	2.02	0.79	2.27	0.84	2.12	0.92
Broiler Production Activities	2.23	0.82	2.28	0.84	2.36	0.82	2.40	0.94
Broiler Processing Activities	2.58	0.92	2.38	1.38	2.37	0.96	2.31	1.02
Marketing of broiler Activities	2.72	0.96	2.33	0.94	2.66	0.94	2.45	0.99
Waste management Activities	1.95	0.83	1.86	0.90	2.01	0.95	1.87	0.98
Provision of Support services	2.10	0.78	2.01	0.85	2.40	0.90	2.10	0.93
Overall index	2.30	0.84	2.15	0.95	2.35	0.90	2.21	0.96

1 = Poor, 2 = Good, 3 = Very Good and 4 = Excellent. Source: Field survey, Tuoho (2022).

The results show that students in all the universities had good knowledge in inputs production and distribution. Students of UENR, however, recorded the highest mean of 2.27 whereas students in KNUST had the lowest mean of 2.02. The higher score of UENR can be explained by the fact that

their first-degree programme is tilted more toward veterinary with the location of the university in one of Ghana's poultry production hubs, this might have contributed to the higher score (Mensah-Bonsu et al., 2019; Yevu & Onumah, 2021).

On broiler production activities AAMUSTED recorded the highest mean score of 2.40 while UCC recorded the lowest mean of 2.23. Generally, students of all the universities had fairly high perceived knowledge score in broiler production activities of value chain.

All the students in the study universities recorded higher or good knowledge on the construct broiler processing activities, however, UCC students had the highest mean of 2.58 (very good) whereas AAMUSTED recorded the lowest mean of 2.31. The very good knowledge of UCC students in the processing activity may be explained by the fact that the University has a BSc. Specialization in agro-processing. Students in this programme participated in this study, at the same time compared to other universities UCC has a commercial meat processing unit that students might be taken practical lessons there as part of their curriculum.

The marketing of broiler activities construct had KNUST students score the lowest mean of 2.33 whiles UCC students scored the highest mean of 2.72 (very good). This notwithstanding students in all the universities had good knowledge in marketing of broiler activities. The construct that all the universities recorded very low knowledge level was waste management activities. However, on this same construct UENR students scored a mean of 2.01, which was the highest and the lowest mean of 1.86 was scored by

KNUST. The higher mean score by UENR students on the waste management activities suggest that the university may have a course in waste management.

On the construct of provision of support services for the broiler value chain KNUST students scored the lowest mean of 2.01 whiles UENR students scored the highest mean of 2.40. Generally, students had good knowledge in the six major broiler value chain activities. It is however worrying that no university had its students recording excellent knowledge in any of the constructs.

Perceived Knowledge Levels in Broiler Value Chain Activities by Students Pursuing Different Agricultural Programmes in Four Public Universities in Ghana

Students' perceived knowledge in the various broiler value chain activities, were compared based on their programmes of study (agribusiness, agricultural extension, agricultural economics, animal science, crop science, agricultural biotechnology and agro processing). The composite means (See appendix L for the detail summary of the means per programme of study) for the six major activities of the domestic broiler value are presented in Table 51.

The results in Table 51 shows that for the construct input production and distribution activity students pursuing agricultural extension in the four study universities had the lowest knowledge level, they recorded a mean of 1.94 compared to the highest mean of 2.36 in same activity scored by agro-processing students. The results show that all the students in the various programmes of study had good knowledge on the construct.

However, the broiler production activity construct had the lowest mean of 2.0 and was scored by students of agro -processing. Whiles animal science

students scored the highest mean of 2.53 (very good), that implies very good knowledge in broiler production activities. This score suggests that animal science programmes across the universities are designed to focus on the production aspect of the broiler value chain and for that matter poultry production rather than focusing on the entire value chain. Given that the animal science students on all six constructs have only been able to obtain the highest score in the broiler production activity.

The agro-processing students obtained a mean of 3.50 (excellent) that is excellent knowledge in broiler processing activities compared with a mean of 2.30 by the agribusiness students. Although the agro-processing students have been obtaining higher means in other constructs as well, this is the highest perceived knowledge level mean score obtained by a programme of study in all the six constructs that the seven programmes are being assessed on. It implies that the agro-processing programme is dynamic and equipped the students a broader scheme of knowledge that can help them fit into most areas of agriculture.

Students of agricultural biotechnology had the lowest mean of 2.25 for the construct on marketing of broiler activities whereas agro-processing students had the highest mean of 2.73 (very good). Students of all the programmes had good knowledge in this construct. Among all the domestic broiler value chain activities that students were assessed on, waste management activities scored the least mean across all programmes. However, agricultural biotechnology scored the lowest mean of 1.75 whiles crop science students scored the highest mean of 1.96. This result can be explained as crop science students having insight due to the possibility of using some of these

waste for manure to enrich the soil for better crop yield. Albeit it was surprising to see the biotechnology students score the least on this construct as their programme is supposed to help solve waste management problems.

The last construct was provision of support services, the highest scored mean of 2.30 was obtained by agro-processing students whiles the least scored mean of 1.79 was obtained by the agricultural biotechnology students. In all the major broiler value chain activities students in the various programmes had good knowledge, very good knowledge, and excellent knowledge in some of the activities.

Table 51: Perceived Knowledge Levels in Broiler Value Chain Activities by Students Pursuing Different Agricultural Programmes in Four Public Universities in Ghana

Activity	Agribusiness		Agric Extension		Agric Economics		Animal Science		Crop Science		Biotech		Agro-Processing	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Inputs Production and Distribution	2.14	0.79	1.94	0.89	2.02	0.75	2.06	0.86	2.11	0.86	1.97	0.78	2.36	0.97
Broiler Production Activities	2.29	0.84	2.15	0.91	2.35	0.81	2.52	0.87	2.30	0.87	2.12	0.90	2.00	0.76
Broiler Processing Activities	2.30	0.95	2.37	1.06	2.31	0.93	2.39	1.00	2.39	1.57	2.37	0.85	3.50	0.55
Marketing of broiler Activities	2.47	0.96	2.42	1.03	2.32	1.08	2.48	0.97	2.36	0.92	2.25	1.02	2.73	0.70
Waste management Activities	1.87	0.89	1.84	0.88	1.91	0.98	1.78	0.88	1.96	0.96	1.75	0.92	1.87	1.10
Provision of Support services	2.18	0.90	2.07	0.90	2.00	0.88	2.02	0.84	2.09	0.89	1.79	0.84	2.30	0.73
Overall index	2.21	0.89	2.13	0.94	2.15	0.91	2.21	0.90	2.20	1.01	2.04	0.89	2.46	0.80

1 = Poor, 2 = Good, 3 = Very Good and 4 = Excellent. Source: Field survey, Tuoho (2022).

ANOVA to Determine the Statistical Significance of the Perceived Knowledge Level of Students in Broiler Value Chain Activities in Four Public Universities in Ghana

A one way analysis of variance (ANOVA) to determine statistically significant differences between the perceived knowledge level of students in UCC, KNUST, UENR, and AAMUSTED offering different programmes in agriculture was carried out. The results are presented in Table 52.

Table 52: ANOVA to Determine the Statistical Significance of the Perceived Knowledge Level of Students in Broiler Value Chain Activities in Four Public Universities in Ghana

Variables		Sum of Squares	df	Mean Square	F	Sig.
Inputs Production and Distribution	Between Groups	4.069	3	1.356	4.669	.003
	Within Groups	191.171	658	.291		
	Total	195.241	661			
Broiler Production Activities	Between Groups	2.560	3	.853	1.385	.246
	Within Groups	401.032	651	.616		
	Total	403.593	654			
Broiler Processing Activities	Between Groups	2.170	3	.723	.610	.609
	Within Groups	776.844	655	1.186		
	Total	779.014	658			
Marketing of broiler Activities	Between Groups	8.863	3	2.954	4.173	.006
	Within Groups	462.982	654	.708		
	Total	471.845	657			
Waste management Activities	Between Groups	1.055	3	.352	.654	.581
	Within Groups	352.525	655	.538		
	Total	353.580	658			
Provision of Support services	Between Groups	6.631	3	2.210	5.165	.002
	Within Groups	279.852	654	.428		
	Total	286.483	657			

$p < 0.05$. 1 = poor, 2 = good 3 = very good, 4 = excellent. Field survey, Tuoho (2022).

The perceived knowledge level of the students was measured using a four-point Likert scale on activities along the domestic broiler value chain. The broad themes or activities that students' perceived knowledge was measured are inputs production and distribution, broiler production activities,

and broiler processing activities. The rest were marketing of broiler activities, waste management activities, and provision of support services.

The results in Table 52 above reveal that there were no statistically significant differences in the perceived knowledge levels of students in the following broiler value chain activities, broiler processing, waste management, and broiler production. On the contrary, there were statistically significant differences in the following activities: inputs production and distribution F (3, 658) = 4.669, *p = 0.003,* marketing of broiler activities F (3, 654) = 4.173, *p = 0.006,* and provision of support services F (3, 654) = 5.165, *p = 0.002*.

To identify the sources of the statistical significant differences found in three out of the six broiler value chain activity areas in which the perceived knowledge levels of the students, were measured, a Levene homogeneity of variance test was carried out (see results presented in Table 53) to determine whether equal variances were assumed or not to enable the selection of the appropriate post hoc test to identify where the statistical significant differences exist in the three dependent variables.

Table 53: Levene Homogeneity of Variance Test on Perceived Knowledge in Inputs Production and Distribution, Marketing of Broiler Activities and Provision of Support Services

Variable	Levene Statistic	Sig.
Inputs Production and Distribution	7.928	.000
Marketing of broiler Activities	.371	.774
Provision of Support services	2.145	.093

$p < 0.05$. Field survey, Tuoho (2022).

The results in Table 53 above reveal that variances for inputs production and distribution were highly significant at 0.5 alpha level. As such equal variance was not assumed F (3, 658) = 4.669, *p = 0 .000,* for inputs

production and distribution activity. However, marketing of broiler activities F (3, 654) = 4.173, $p = 0.077$, and provision of support services F (3, 654) = 5.165, $p = 0.093$, were not significant. Implying that equal variance was assumed, for this reason, the LSD post hoc test was chosen to identify where the statistically significant differences exist in the marketing activity variable, whiles Tukey HSD was used for the provision of support services activity. Since equal variance was not assumed F (3, 658) = 4.669, $p < 0.000$, for inputs production and distribution activity. The Tamhane test was used to determine where statistically significant differences exist in the inputs production and distribution activity.

The LSD post hoc results (see appendix M) reveal that for the marketing of broiler activities the statistically significant differences were due to UCC students (Mean = 2.70, Std. = 0.80) and UENR students (Mean = 2.65, Std.=0.81) obtaining a higher mean score than KNUST students (mean = 2.32, Std. = 0.85). This implies that UCC and UENR students perceived knowledge level in the marketing of broiler activities was higher than KNUST students. This can be explained by plausible differences in their programme structure which would have exposed them (UCC and UENR students) more to what pertains to the marketing of broilers than KNUST students.

On the provision of support services, the Tukey HSD post hoc test results, attached in appendix N reveal the source of the statistically significant differences to be due to UENR students (Mean = 2.39, Std.=0.64) having a higher mean score than KNUST students (mean = 2.01, Std. = 0.62) and AAMUSTED students (mean = 2.10, Std. = 0.71). UENR is in Dormaa, a town where there are a lot of poultry farms (Dziwornu & Sarpong, 2014;

Mensah-Bonsu et al., 2019; Yevu & Onumah, 2021), aside from the plausible programme differences between UENR, KNUST, and AAMUSTED the daily involvement of people within their environment would have influenced their perceived knowledge level positively.

Tamhane post hoc test results (see attached O) for inputs production and distribution activity shows that the statistically significant differences existed because UENR students (Mean = 2.27, Std.= 0.48) obtained a higher mean score than KNUST students (mean = 2.02, Std. = 0.50). This means the perceived knowledge level of UENR students in inputs production and distribution activity along the domestic broiler value chain was higher than that of the students of KNUST.

ANOVA to Determine the Statistical Significance of the Perceived Knowledge Level of Students Pursuing Different Agricultural Programmes in Four Public Universities in Ghana.

The one way analysis of variance (ANOVA) was carried out to determine statistically significant differences between the perceived knowledge level of students pursuing agribusiness, animal science, and agricultural biotechnology. The rests are crop science, agro-processing, and agricultural extension as well as agricultural economics in four Ghanaian public universities on key domestic broiler value chain activities.

These activities that students' perceived knowledge levels were measured are inputs production and distribution, broiler production activities, and broiler processing activities. The rest were marketing of broiler activities, waste management activities, and provision of support services.

The scale used to measure the perceived knowledge level of students was a four-point Likert scale. The results are presented in Table 54, according to the results only broiler production activity was statistically significant F (6, 648) = 2.465, *p = 0.023* out of the six activities (dependent variables).

Table 54: ANOVA to Determine the Statistical Significance of the Perceived Knowledge Level of Students Pursuing Different Agricultural Programmes

Variables		Sum of Squares	df	Mean Square	F	Sig.
Inputs Production and Distribution	Between Groups	2.660	6	.443	1.508	.173
	Within Groups	192.581	655	.294		
	Total	195.241	661			
Broiler Production Activities	Between Groups	9.004	6	1.501	2.465	.023
	Within Groups	394.588	648	.609		
	Total	403.593	654			
Broiler Processing Activities	Between Groups	7.530	6	1.255	1.061	.385
	Within Groups	771.484	652	1.183		
	Total	779.014	658			
Marketing of broiler Activities	Between Groups	4.071	6	.679	.944	.463
	Within Groups	467.774	651	.719		
	Total	471.845	657			
Waste management Activities	Between Groups	3.495	6	.582	1.085	.370
	Within Groups	350.086	652	.537		
	Total	353.580	658			
Provision of Support services	Between Groups	5.352	6	.892	2.066	.055
	Within Groups	281.131	651	.432		
	Total	286.483	657			

p < 0.05. 1 = poor, 2 = good, 3 = very good, 4 = excellent. Field survey, Tuoho (2022).

This implies that the perceived knowledge level of students in the four public universities across the seven programmes of study in agriculture have the same perceived knowledge level in all the domestic broiler value chain activities except in broiler production activity. This suggest that students might only be taught the production activity of the value chain without the other five activities that completes the domestic broiler value chain.

To identify the source or where the statistically significant differences exist, a Levene homogeneity of variance test was carried out to be able to

choose the appropriate post hoc test that will identify where the statistical differences exist in the variable. The result of the test is presented in Table 55.

Table 55: Levene Homogeneity of Variance Test on Perceived Knowledge Level in Broiler Production Activities Among Students in Different Programmes

Levene Statistic	Sig.
0.196	0.978

$p < 0.05$. Field survey, Tuoho (2022).

The results in Table 55 above show that the test was not significant F (6, 648) = 2.465, $p = 0.978$ at 0.05 alpha level, therefore, an equal variance was assumed. In view of this, the LSD post hoc test was chosen to identify the source of the statistically significant differences in broiler production activities. The results (detailed results are in appendix P) reveal that the existence of statistically significant differences in broiler production activities was due to animal science students (mean = 2.52, Std. = 0.78) obtaining a higher mean score than agribusiness students (mean = 2.29, Std. = 0.76), agricultural extension students (mean = 2.15, Std. = 0.81) and agricultural biotechnology students (mean = 2.11, Std. = 0.82) as well as crop science students (mean = 2.30, Std. = 0.78).

This implies that the perceived knowledge level of animal science students in broiler production activities was higher than the student's pursuing agribusiness, agricultural extension, agricultural biotechnology, and crop science. Since animal science students specialize in the production of various types of livestock including broiler, their programme structure has helped them to have an urge over the others.

Examining the Perception of Ghanaian Tertiary Students Towards Choosing Broiler Value Chain Business as a Vocation

The second part of addressing objective four of this study was to measure the perception of undergraduate final year students offering agriculture and agriculture related programmes in four public universities (UCC, KNUST, UENR, and AAMUSTED) toward engaging in broiler value chain activities after graduation as a vocation. Study participants were provided with a five-point Likert scale with statements in four constructs with one being the lowest and five being the highest. The results of the analysed means, standard deviations are presented in Table 56.

The results from Table 56, shows that parents have not told their wards not to be involved in any farming or agriculture related activity as majority (67.6%) of the students disagreed to this statement. This implies that should students venture into agriculture or farming after school it would be an independent decision. They are also likely to get the support of their parents. The finding contradicts what was reported by Sumberg and Okali (2013) that African parents who are farmers discourage their children from taking up farming after them.

In contrast, more than half (56.1%) of the students disagree and strongly disagree that broiler value chain activities are not respected. It can be concluded that students in search of a noble venture to undertake after school will likely consider an activity along the broiler value chain because they see it to be noble. This finding disagrees with what has been reported by Mwaura et al. (2015) on the perception of Ghanaian youth toward agriculture in general. That they perceived the sector to be unattractive and not a respected vocation.

However, only 7.8% of the students agree that broiler value chain jobs are for older people. This is consistent with what was reported by Sumberg et al. (2017), that Ghanaian youth have negative perception toward agriculture and farming activities.

This provides a promising future for the broiler value chain since most (52.5%) of the youth do not perceive it to be a prerogative of older people. With regards to gender stereotype around agricultural activities, the results show that students do not think any activity along the chain is meant for any gender as majority disagree that processing and marketing activities along the chain are meant for women with 65.3% and 57.3% disagreeing to the former and latter respectively. This notwithstanding Mensah-Bonsu et al. (2019) reported in their study that 90.7% of poultry producers in the Dormaa and Sunyani enclave were men whereas trading and processing segments of the poultry value chain were dominated by women who constituted 89.2 percent and 84.4 percent respectively.

On the perception of agricultural activities or broiler value chain activities being a job for the less privileged or poor people in society, the findings show that students interviewed in this study disagree (85.1%) with that perception. This finding collaborate with what has earlier been reported by several authors, that engagement in livestock value chain activities as a livelihood or business venture was an easy path to escape poverty on the African continent (African Union, 2015; Mensah-Bonsu et al., 2019; Rich et al., 2009). This implies that majority of students do not think broiler production is for the less privileged in the society.

Table 56: Perception of Students Towards Engaging in the Activities of the Domestic Broiler Value Chain

Statements	Strongly disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly agree (5)	Mean	Std. Deviation
Socio-cultural Perceptions							
My parents told me not to be involved in any farming or agriculture related activity as a business or employment	492 (67.6)*	138 (19.0)	38 (5.2)	36 (4.9)	24 (3.3)	**1.57**	1.02
Broiler value chain businesses are not respected	154 (21.2)	254 (34.9)	245 (33.7)	48 (6.6)	27 (3.7)	**2.37**	1.01
Broiler value chain jobs are dirty to do	204 (28.0)	209 (28.7)	161 (22.1)	109 (15.0)	45 (6.2)	**2.43**	1.22
Broiler value chain jobs are for older people	382 (52.5)	215 (29.5)	74 (10.2)	32 (4.4)	25 (3.4)	**1.77**	1.03
Broiler businesses are for poor people	477 (65.5)	150 (20.6)	64 (8.8)	25 (3.4)	12 (1.6)	**1.55**	0.91
Broiler production is job for males	363 (49.9)	179 (24.6)	151 (20.7)	19 (2.6)	16 (2.2)	**1.83**	0.99
Feed milling job is jobs for males	301 (41.3)	203 (27.9)	128 (17.6)	67 (9.2)	29 (4.0)	**2.07**	1.15
Females are supposed to carry out poultry processing in the broiler value chain	243 (33.4)	232 (31.9)	133 (18.3)	81 (11.1)	39 (5.4)	**2.23**	1.18
Females are supposed to carry out marketing activities in the broiler value chain	211 (29.0)	206 (28.3)	137 (18.8)	116 (15.9)	58 (8.0)	**2.46**	1.28
Broiler value chain jobs are difficult or more demanding	57 (7.8)	75 (10.3)	247 (33.9)	238 (32.7)	111 (15.2)	**3.37**	1.10

Table 56: continue

Broiler farming makes you poor	419 (57.6)	191 (26.2)	69 (9.5)	32 (4.4)	17 (2.3)	**1.68**	0.98
Farmers work hard for little reward	116 (15.9)	137 (18.8)	198 (27.2)	141 (19.4)	136 (18.7)	**3.06**	1.33
Broiler production is for school dropouts and illiterates	501 (68.8)	138 (19.0)	45 (6.2)	28 (3.8)	16 (2.2)	**1.52**	0.93
Broiler production is for the less privileged in the society	435 (59.8)	184 (25.3)	62 (8.5)	30 (4.1)	17 (2.3)	**1.64**	0.96
Index						**2.11**	
Economic Perceptions							
Broiler value chain businesses are not profitable	334 (45.9)	240 (33.0)	96 (13.2)	38 (5.2)	20 (2.7)	**1.86**	1.01
Broiler value chain business is a high risk one due to disease out breaks	44 (6.0)	83 (11.4)	209 (28.7	209 (28.7	183 (25.1)	**3.55**	1.16
The depreciation of the Ghana cedis may increase cost of production and rendering and rendering the business unsustainable	24 (3.3)	59 (8.1)	168 (23.1)	225 (30.9)	252 (34.6)	**3.85**	1.09
Broiler value chain jobs are not well paying	95 (13.0)	235 (32.3)	226 (31.0)	120 (16.5)	52 (7.1)	**2.72**	1.11
Broiler value chain businesses are capital intensive, because of this young people cannot start such a business on their own	35 (4.8)	90 (12.4)	187 (25.7)	188 (25.8)	228 (31.3)	**3.66**	1.18
High feed cost would affect the business turn over (profitability)	24 (3.3)	52 (7.1)	137 (18.8)	228 (31.3)	287 (39.4)	**3.96**	1.08
Whole scale importation of poultry production inputs makes broiler value chain business frustrating to young starters	26 (3.6)	62 (8.5)	188 (25.8)	250 (34.3)	202 (27.7)	**3.74**	1.06

Table 56: continue

Index						**3.33**	
Government policy perceptions							
Government has no consistent poultry production policy	37 (5.1)	93 (12.8)	188 (25.8)	227 (31.2)	183 (25.1)	**3.59**	1.14
There is no sufficient extension support to poultry producers	80 (11.0)	115 (15.8)	208 (28.6)	208 (28.6)	`117 (16.1)	**3.23**	1.22
There is little or no use of technology and machines in broiler production in Ghana	75 (10.3)	108 (14.8)	207 (28.4)	187 (25.7)	151 (20.7)	**3.32**	1.24
The poultry industry is not a priority to Government of Ghana	57 (7.8)	106 (14.6)	238 (32.7)	179 (24.6)	148 (20.3)	**3.35**	1.18
Ghana government has no import substitution policy to reduce and eliminate importation of frozen chicken into Ghana	47 (6.5)	75 (10.3)	201 (27.6)	210 (28.8)	195 (26.8)	**3.59**	1.17
Local broiler business is not given subsidies to lower their cost of production as such unable to compete with foreign frozen chicken imports	27 (3.7)	75 (10.3)	164 (22.5)	269 (37.0)	193 (26.5)	**3.72**	1.08
University education does not adequately prepare first degree holders to start their own business	80 (11.0)	109 (15.0)	169 (23.2)	154 (21.2)	216 (29.7)	**3.44**	1.34
Index						**3.46**	
Resource availability							
It is not easy for young people to access credit to start or scale-up broiler production	67 (9.2)	82 (11.3)	126 (17.3)	196 (26.9)	257 (35.3)	**3.68**	1.31
Young people do not have easy access to get land for broiler value chain activities	38 (5.2)	69 (9.5)	140 (19.2)	226 (31.0)	225 (35.0)	**3.81**	1.17
Information needed to support broiler value Chain activities are not easily available to young people	57 (7.8)	133 (18.3)	204 (28.0)	199 (27.3)	135 (18.5)	**3.30**	1.19
Production inputs are not readily available	36 (4.9)	93 (12.8)	194 (26.6)	235 (32.3)	170 (23.4)	**3.56**	1.13

Table 56: continue

It is not easy to sell broiler meat and meat products in Ghana	100 (13.7)	198 (27.2)	228 (31.3)	137 (18.8)	65 (8.9)	**2.82**	1.16
It is not easy to sell live Broiler in Ghana	110 (15.1)	234 (32.1)	242 (33.2)	101 (13.9)	41 (5.6)	**2.63**	1.07
There are no broiler processing plants/ factories in my region	247 (33.9)	150 (20.6)	162 (22.3)	110 (15.1)	59 (8.1)	**2.43**	1.31
Index						**3.18**	
Overall Index						**3.02**	

1 = Strongly disagree, 2 = Disagree, 3 = Somewhat agree, 4 = Agree and 5 = Strongly agree. * Figures in parenthesis are in percentages. Field survey, Tuoho (2022).

The overall index or composite for the socio-cultural perceptions was 2.11 (disagree). In conclusion, for the statements under sociocultural perceptions, students do not perceive any sociocultural stereotype against their engagement in broiler production and its related value chain activities since they disagreed with the statements.

Moreover, students perceived broiler business to be profitable (mean = 1.86, Std. = 1.01) since only 7.9% agree otherwise. This means students who intend to pursue a profitable business, will consider choosing broiler production and its related value chain activities. Magagula and Tsvakirai (2020) have posited that youth who have a positive economic perception about a particular agribusiness are more likely to venture into it. Also, students perceived broiler production and the activities along the broiler value chain to be a high-risk activity (mean = 3.55, std.= 1.16). This was revealed in the findings as 53.8% of the students agree that broiler production is a high-risk venture due to disease outbreaks. This concur with the report of Salvago et al. (2019) who reported on how perceived high risks of livestock farming was keeping the youth of Spain's Catalonian region away from engaging in the sector.

Also, they perceive the macroeconomic conditions of the country to be affecting broiler value chain production activities. Majority (65.5%) perceive the depreciation of the cedi would increase the cost of production (mean = 3.85, Std. = 1.09). Since some cost items used in production and processing activities are imported. This statement recorded the highest mean among all the statements. These findings demonstrate the high level of awareness of students about the broiler value chain and the Ghanaian economy. Given that

the Bank of Ghana reported in October 2022 that the Ghana cedis had lost more than 37% of its value against the US dollar and other international currencies (Bank of Ghana, 2022).

Furthermore, students perceive broiler production to be capital intensive and further perceive high cost of feed would affect profitability. The findings revealed that 67.1% and 70.75% agreed to the latter and the former. With an index of 3.33 for perceptions on economic conditions, students somewhat agree that the economic conditions in the country do not favour broiler production as they perceive it to impact on the feed cost and the margins of actors. It implies that students with a profit mind set would not choose broiler value chain business as a venture under the prevailing circumstance.

On the perceptions of government policy, students believe that the government has no consistent policy to support the poultry value chain in Ghana as 56.3% of the students agree to the statement above. This result contradicts what was reported by Sumberg et al. (2017) that, though there was government policy on the poultry industry, it was, however, challenged by the fact that it lacks trade policies that offer minimal protection to poultry farmers, and available mechanism that enables the gathering of data for the poultry value chain in Ghana. It must also be stated that at the time Sumberg et al. (2017) authored the article there was a policy, but it has travelled its full period of implementation and no longer exist.

Also, the students were neutral on whether there was sufficient extension support to the poultry industry as the statement had a mean score of 3.23, revealing their neutrality on extension support for the industry. In

addition, with a mean of 3.32 and 3.35, students were neutral on the use of technology and machines in broiler production and on the poultry industry being a priority to the government.

Moreover, 55.6% of students perceived the government to have no import substitution policy to reduce or eliminate importations of frozen chicken and chicken products. This means students perceive that importation of poultry and related products will be an issue to them should they venture into broiler production as the government has no policy to reduce the importation. This finding agrees with what Sumberg et al. (2017) has reported, that government policies on the poultry industry lack trade policies that offer minimal protection to Ghanaian poultry businesses. Also, imported chicken is cheaper than the locally produced one which is likely to affect the demand decisions of chicken consumer.

Additionally, majority of student are of the perception that university education does not prepare first degree holders to start their own business. This was revealed in the findings as 50.9% of the student agreed and strongly agreed to this statement. The statement had a mean score of 3.44 indicating that students were tilted toward agreeing that university education does not prepare first degree holders to venture into entrepreneurship. In the end, students agreed with a composite mean index of 3.46 that currently government policies do not support the growth and sustainability of the poultry industry particularly the broiler value chain.

Furthermore, students perceive it is not easy to access credit to either start or scale up broiler production and its related value chain activities. This was revealed in the findings as this statement obtained a mean of 3.68. To it,

students who intend to use borrowed funds in starting a broiler production business or its related activities are likely not to do so since they perceive it was not easy or possible to acquire a loan. This is consistent with what has been reported in literature by several authors that it was difficult for actors of the broiler value chain and others in the poultry industry to get credit from financial institutions for their activities (Adei & Asante, 2012; McLeod et al., 2009; Mensah-Bonsu et al., 2019).

Additionally, most students perceived that land was not readily available to the youth for broiler value chain activities, 66% of the students together agreed and strongly agreed on this with a mean score of 3.81. Ng'atigwa et al. (2020) reported that lack of land access was a key factor that was keeping the youth of Njombe Region in Tanzania from horticulture agribusiness.

However, students had a neutral perception on the access to information to support broiler production activities, they also perceived inputs not to be readily available for production. The former statement had a mean of 3.30 (neutral) while the latter had 3.56 (agreed). This indicates that student's perceived that these issues can hinder their business should they venture into broiler value chain business in the future if nothing is done to make inputs and information support services readily available. It can, therefore, affect their decision to choose broiler value chain activities as a vocation after school.

Overall students had a neutral perception (overall mean = 3.02) about the sociocultural perceptions surrounding the broiler value chain, economic conditions, government policy to support the industry and resource availability for the industry.

Perception of Students Towards Engaging in Broiler Value Chain Activities in Four Public Universities in Ghana

The perception of students in four public universities (UCC, KNUST, UENR, and AAMUSTED) toward engaging in activities of the domestic broiler value chain after graduation as a vocation was measured using a five-point Likert-scale with four constructs (socio-cultural perceptions, economic perceptions, government policy perceptions, and resource availability), one being the lowest and five being the highest. The composite means and standard deviations of the constructs were computed and presented in Table 57. The detailed mean and standard deviation computations per university are attached in appendix Q.

Table 57: Perception of Students Towards Engaging in Broiler Value Chain Activities in Four Public Universities in Ghana

Construct	UCC		KNUST		UNER		AMMUSTED	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Socio-cultural Perceptions	2.03	1.00	2.12	1.05	2.23	1.12	2.07	1.13
Economic Perceptions	3.10	1.14	3.38	1.05	3.11	1.17	3.34	1.14
Government policy perceptions	3.19	1.21	3.49	1.14	3.31	1.20	3.49	1.29
Resource availability	3.08	1.12	3.25	1.16	3.05	1.10	3.09	1.27
Overall Index	**2.85**	**1.12**	**3.06**	**1.10**	**2.93**	**1.15**	**3.00**	**1.21**

1 = Strongly disagree, 2 = Disagree, 3 = Somewhat agree, 4 = Agree and 5 = Strongly agree. Field survey, Tuoho (2022).

The results in Table 57, show that of the four constructs all the students in the various universities disagree that there were socio-cultural perceptions that were adversely affecting the decision of students to choose the broiler value chain as a vocation after graduation. The lowest mean of 2.03 was recorded by the students of UCC whiles the highest mean of 2.23 was recorded by UENR

students. The location of UENR in a poultry producing town may have exposed the students to the industry allowing them to have an insight and the demographics of the actors, this probably influence the score of the students.

On the economic perceptions construct, the students from KNUST were more tilted towards agreeing (mean = 3.38, std. =1.05) that the turbulent economic conditions prevailing in the country would affect the businesses of the actors of the broiler value chain and for that matter their decision to choose the sector to engage in after graduation. Whereas UCC (mean = 3.10, std. = 1.14), UENR (mean = 3.11, std. = 1.17), and AAMUSTED (mean = 3.34, std. = 1.14) respectively somewhat agree. The location of KNUST in the heart of Kumasi town would have exposed them directly to the implications of the current depreciation of Ghana's currency and other economic turbulence in the nation than the other institutions, hence the higher mean on the economic perceptions construct.

On the construct of unfavourable or lack of government policy toward the broiler value chain, students of both KNUST and AAMUSTED agreed by obtaining a mean score of 3.49. The UCC and UENR where however, somewhat agree by obtaining a mean of 3.19 and 3.31 respectively. The high mean score of KNUST in this construct also suggest that among the universities studied KNUST students might be politically active and more involved in the national political discourse than the rest of the institutions given that they had also scored high in the economic perceptions construct.

The results of the resource availability construct show that students from the four universities were neutral on the lack of access to resources that would enable young people to engage in the domestic broiler value chain.

This notwithstanding students of KNUST scored the highest mean of 3.25 whiles the lowest mean of 3.05 was scored by the students of UENR

Perception of Students Pursuing Different Agricultural Programmes in Four Public Universities in Ghana Towards Engaging in Broiler Value Chain Activities

Students' perception on the following constructs or variables socio-cultural perceptions, economic perceptions, government policy perceptions, and resource availability towards engaging in the various broiler value chain activities, were compared on the basis of their programmes of study (agribusiness, agricultural extension, agricultural economics, animal science, crop science, agricultural biotechnology and agro processing). The composite means for the four constructs (socio-cultural perceptions, economic perceptions, government policy perceptions, and resource availability) are presented in Table 58. The detail summary of means and standard deviations per programme of study can be found in appendix R. The results presented in Table 58, reveals that students of all the different programmes of study disagree that there were negative socio-cultural perceptions that exist against young people's engagement with broiler value chain, thus affecting their decision to engage in the domestic broiler value chain after graduation. On these socio-cultural perceptions construct, the lowest mean (1.82) was recorded by agro-processing students whiles the highest mean (2.19) was recorded by agribusiness students.

Students of agricultural economics agreed (mean = 3.46, std. = 1.02) that the prevailing adverse economic situation in the country is negatively affecting broiler value chain businesses and would, therefore, discourage them

from choosing to engage in the broiler value chain as a vocation after graduation. Although, the students of the remaining programmes were neutral (somewhat agree) on this construct, agro-processing students had the lowest mean score of 3.06. The higher mean score by the students of agricultural economics indicates that they have been able to use the knowledge gained through their programme of study to interpret and understand the developments in the economy of Ghana and its implications on businesses.

However, the government policy perceptions construct, which seek to find out from respondents whether they agree that there are no government policies aimed at helping to grow broiler value chain businesses by creating the enabling business environment saw all the programmes except agro-processing and crop science students agreeing. The lowest mean score of 3.34 and the highest mean of 3.53 was recorded by agro-processing students and agricultural economics students respectively. On the resource availability construct agro-processing students scored the lowest mean of 3.00 implying that they were neutral to whether there were resources available for young people who want to start businesses in the broiler value chain or not. This notwithstanding, the construct had students in all the programmes recording neutral, although the highest mean score of 3.25 was by agribusiness students.

Table 58: Perception of Students Pursuing Different Agricultural Programmes in Four Public Universities in Ghana Towards Engaging in Broiler Value Chain Activities

Construct	Agribusiness		Agric Extension		Agric Economics		Animal Science		Crop Science		Biotech		Agro-Processing	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Socio-cultural Perceptions	2.19	1.09	2.07	1.08	1.99	0.91	1.97	1.01	2.17	1.10	2.13	1.10	1.82	0.84
Economic Perceptions	3.32	1.06	3.39	1.10	3.46	1.02	3.29	1.10	3.34	1.11	3.37	1.09	3.06	1.34
Government policy perceptions	3.45	1.12	3.46	1.28	3.53	1.14	3.49	1.23	3.43	1.23	3.51	1.16	3.34	1.28
Resource availability	3.25	1.09	3.17	1.32	3.23	1.10	3.15	1.16	3.14	1.22	3.21	1.23	3.00	1.17
Overall Index	**2.44**	**0.87**	**2.42**	**0.95**	**2.44**	**0.83**	**2.38**	**0.90**	**2.42**	**0.93**	**2.44**	**0.92**	**2.24**	**0.93**

1 = Strongly disagree, 2 = Disagree, 3 = Somewhat agree, 4 = Agree and 5 = Strongly agree. Field survey, Tuoho (2022).

ANOVA to Determine the Statistical Significance of the Perception of Students Towards Engaging in Broiler Value Chain Activities in Four Public Universities in Ghana

The results of one way analysis of variance (ANOVA) to determine if there were statistically significant differences between students in four public universities (UCC, KNUST, UENR, and AAMUSTED) offering different programmes in agriculture on the various perception constructs (social-cultural perceptions, economic perceptions, government policy perceptions and resource availability perceptions) aimed at assessing their willingness to engage in the broiler value chain as a vocation after graduation are presented in Table 59.

Table 59: ANOVA to Determine the Significance Level of Perception of Students Towards Engaging in Broiler Value Chain Activities in Four Public Universities in Ghana

		Sum of Squares	df	Mean Square	F	Sig.
Socio-cultural Perceptions	Between Groups	1.443	3	.481	1.330	.264
	Within Groups	261.961	724	.362		
	Total	263.404	727			
Economic Perceptions	Between Groups	5.938	3	1.979	4.747	.003
	Within Groups	301.910	724	.417		
	Total	307.848	727			
Government policy perceptions	Between Groups	5.036	3	1.679	3.327	.019
	Within Groups	365.245	724	.504		
	Total	370.281	727			
Resource availability	Between Groups	3.420	3	1.140	1.895	.129
	Within Groups	435.460	724	.601		
	Total	438.880	727			

p < 0.05. 1 = Strongly disagree, 2 = Disagree, 3 = Somewhat agree, 4 = Agree and 5 = Strongly agree. Field survey, Tuoho (2022).

The results in Table 59, show statistically significant differences in the economic perceptions F (3, 724) = 4.747, *p = 0.003* and government policy perceptions F (3, 724) = 3.327, *p = 0.019* constructs whereas resource

availability and the socio-cultural perceptions construct was not statistically significant. This implies that there were differences in the perception of students in the four public universities towards engaging in the domestic broiler value chain activities as a vocation after graduation in the economic perception and government policy perception constructs which apparently were non-existent in the socio-cultural perception and resource availability constructs.

To identify where the statistically significant differences exist in the two constructs (economic perception and government policy perception) the Levene homogeneity of variance test was carried out to be able to choose the appropriate post hoc test that will identify where the statistically significant differences exist in the variables, the results are presented in Table 60.

Table 60: Levene Homogeneity of Variance Test on Economic Perception and Government Policy Perception Among Students in Different Universities

	Levene Statistic	Sig.
Economic Perceptions	.759	.518
Government policy perceptions	2.578	.053

p < 0.05. Field survey, Tuoho (2022).

The results in Table 60 show that neither economic perception F (3, 724) = 4.747, *p = 0.518* nor the government policy perception constructs F (3, 724) = 3.327, *p = 0.053* were significant. As such variance was assumed, for this reason a Tukey HSD post hoc test was undertaking to identify the source of the statistically significant differences.

The Tukey HSD test results (see appendix S) show that the difference in the economic perceptions construct was due to KNUST students (mean =

3.38, std. = 0.62) obtaining a higher mean score than the students of UCC (mean = 3.09, std. = 0.65) and UENR (mean = 3.11, std. = 0.72). This implies that though the students of the three universities perception on whether the unfavourable economic conditions of the country will affect their decision to engage in the broiler value chain as a business after graduation was somewhat agree, KNUST students however, were tilting towards agreeing that current unfavourable national economic conditions will affect their participation in the broiler value chain after graduation if things stay the same.

Similarly, the same Tukey HSD post hoc test in Appendix S has identified the source or where the statistically significance differences exist for the government policy perception construct. The results show that KNUST (mean = 3.49, std. = 0.68) and AAMUSTED (mean = 3.49, std. = 0.75) had a higher mean score on the construct than students of UCC (mean = 3.18, std. = 0.81). This implies that KNUST and AAMUSTED students agree that government policies are unfavourable towards the development of the domestic broiler value chain and would, therefore, negatively affect their decision to take to broiler value chain activities after the completion of their programmes of study in their respective universities.

ANOVA to Determine the Statistical Significance of the Perception of Students Pursuing Different Agricultural Programmes in Four Public Universities in Ghana Towards Engaging in Broiler Value Chain Activities

Table 61 presents the results of a one way analysis of variance (ANOVA) to determine if there is statistically significant differences between the perception of students offering different programmes (agribusiness, animal

science, agricultural biotechnology, crop science, agro-processing, agricultural extension and agricultural economics) in four of Ghana's public universities on the various perception constructs (social-cultural perceptions, economic perceptions, government policy perceptions and resource availability perceptions).

Table 61: ANOVA to Determine the Statistical Significance of the Perception of Students Pursuing Different Agricultural Programmes in Four Public Universities in Ghana Towards Engaging in Broiler Value Chain Activities

		Sum of Squares	df	Mean Square	F	Sig.
Socio-cultural Perceptions	Between Groups	6.385	6	1.064	2.985	.007
	Within Groups	257.019	721	.356		
	Total	263.404	727			
Economic Perceptions	Between Groups	2.140	6	.357	.841	.538
	Within Groups	305.707	721	.424		
	Total	307.848	727			
Government policy perceptions	Between Groups	.818	6	.136	.266	.953
	Within Groups	369.463	721	.512		
	Total	370.281	727			
Resource availability	Between Groups	3.309	6	.552	.913	.485
	Within Groups	435.571	721	.604		
	Total	438.880	727			

p < 0.05. 1 = Strongly disagree, 2 = Disagree, 3 = Somewhat agree, 4 = Agree and 5 = Strongly agree. Field survey, Tuoho (2022).

The results show that there were statistically significant differences in the perception of students in the various programmes of study for the construct social-cultural F (6, 721) = 2.985, *p = 0.007*, however, the construct economic perception, government policy perception and resource availability did not show statistically significant differences across the different programmes.

Implying that, though there are differences in the perception of students in the various programmes of study, in the four public universities concerning how socio-cultural perceptions may adversely affect their decision to choose the domestic broiler value chain as an avenue of employment after

graduation. These differences in perception did not exist in the economic perception, government policy perception and resource availability constructs. To this end, students across these programmes held the same view.

Since the socio-cultural perception was statistically significant F (6, 721) = 2.985, *p = 0.007*, there was the need to identify where the statistically significant differences exist, to this end a Levene homogeneity of variance test among students in the different programmes of study in the four public universities in Ghana was conducted and the results presented in Table 62.

Table 62: Levene Homogeneity of Variance Test on Socio-Cultural Perception Among Students in Different Programmes of Study

Levene Statistic	Sig.
2.118	.049

p < 0.05. Field survey, Tuoho (2022).

The Levene homogeneity of variance test was conducted to enable the selection of the appropriate post hoc test to be selected and carried out to identify where the significant differences exist among students of the various programmes. The results of the test presented in Table 62 show that socio-cultural perception was significant at 0.05 alpha level F (6, 721) = 2.985, *p = 0.049*. In lieu of this, a Tamhane post hoc test was carried out to identify where the statistically significant differences exist among students of the various programmes. The results (See appendix T) of the test show that the statistically significant differences in the social-cultural perceptions construct were due to differences in the mean score of students of agribusiness (mean = 2.18, std. = 0.65), crop science students (mean = 2.17, std. = 0.60) and animal science (mean = 1.96, std. = 0.51). The agribusiness students and crop science students both had a higher mean score than animal science students. Although,

the general perception held by agribusiness, crop science and animal science students on the socio-cultural perception construct is that they disagree that there were negative socio-cultural perceptions about youth involvement in the domestic broiler value chain. The scores obtained by agribusiness and crop science students were more towards a somewhat agree perception on the construct.

Determinants of Students' Decision to Choose Broiler Value Chain as a Business or Vocation After Graduation

Objective five (5) examined the drivers of Ghanaian tertiary students' (youth) engagement in the domestic broiler value chain. To achieve what this objective was set out to accomplish, the first step was to predict the factors that determine the decision or willingness to choose the domestic broiler value chain (poultry production) by final year undergraduate students as a business or vocation after graduation using a probit regression model.

The coefficients and the marginal ratios of the probit regression model results are presented in Table 63. The Pseudo R^2 which indicates how the independent variables jointly explained the changes observed in the dependent variable was 4.8% and this was significant at 1%. This indicates that the regressors significantly explained the changes observed in the dependent variable.

Table 63: Factors Influencing the Decision of Students to Choose Broiler Value Chain as Business or Vocation After Graduation

Variable	Coef.	Std. Err.	dy/dx	Std. Err.	P>z
Sex (1 = male)	0.308***	0.114	0.113	0.041	0.007
Age	0.023	0.021	0.009	0.008	0.273
Household size	-0.005	0.015	-0.002	0.005	0.751
Place of residence (1=urban)	-0.179	0.136	-0.065	0.050	0.189
Place of residence of parents (1=urban)	0.074	0.133	0.027	0.049	0.580
Parents are farmers (1=yes)	0.075	0.124	0.028	0.045	0.543
Parents are poultry farmers (1=yes)	0.434***	0.141	0.159	0.051	0.002
Engages in economic activity (1=yes)	0.119	0.104	0.044	0.038	0.251
Perceive poultry industry to lack government support	-0.066	0.105	-0.024	0.038	0.529
Perceive Economic conditions not favourable for the poultry industry	-0.128	0.123	-0.047	0.045	0.295
Perceive Resource availability to be difficult	-0.012	0.103	-0.004	0.038	0.906
Perceive Broiler production not sociocultural sound	0.120	0.211	0.044	0.077	0.569
Perceive poultry to involve high risk	-0.035	0.108	-0.013	0.039	0.742
Perceive high capital requirement to start poultry business	0.138	0.113	0.050	0.041	0.222
Perceived knowledge on value chain activities	0.248*	0.150	0.091	0.054	0.098
_cons	-0.754	0.520			0.147
Test Statistics					
Number of observations	728				
LR $chi^2(15)$	47.2				
Prob > chi^2	0.000				
Log likelihood	-466.270				
Pseudo R^2	0.0482				

***, ** and * represent significant levels at 1, 5 and 10 % respectively. 1 = Strongly disagree, 2 = Disagree, 3 = Neutral, 4 = Agree and 5 = Strongly agree. Field survey, Tuoho (2022).

To confirm the presence of the problems of multicollinearity or otherwise a variance inflation factor (VIF) computation was done for each predicting variable and the results presented in appendix U. The VIF results range from 1.03 to 2.00 with a mean of 1.33, this is within the 1 to 5 recommend threshold. Hence, no corrective measures are required (Dadzie et al., 2020).

The results show that sex (1 = male) had a positive coefficient and was significant at 1% (Coef. = 0.308 with P>z = 0.007). This implies that male students are more likely to go into broiler value chain activities after school than female students and this increases by 11.3% when a student is a male. It could be because male students have higher entrepreneurial ambitions than their female counterparts (Westhead & Solesvik, 2016; Wilson et al., 2007). Additionally, it could also be explained by the fact that most of the activities of the broiler value chain are labour intensive which many females are unable to endure compared to their male colleagues, hence their disinterest to pursue a career in domestic broiler value chain (Mensah-Bonsu et al., 2019).

This finding is consistent with what was reported by Tarekegn et al. (2022) in their study that assessed 160 Ethiopian youth participation in agribusiness and found 89.38% of the respondents undertaking agribusiness ventures to be males. In a related study, Ng'atigwa et al. (2020) also reported that among 576 rural youth who were studied for their participation in Tanzania's horticultural agribusiness, 59.6% were found to be males.

Ng'atigwa et al. (2020) further submitted that gender (female) had negative and significant influence on the involvement of the youth in horticulture agribusiness, implying that female youth are less likely to choose horticulture agribusiness as a vocation. Additionally, Mulema et al. (2021) in their study that assessed youth engagement in agribusiness in Vietnam and Zambia noted that there were more females than males in both countries who preferred off-farm labour.

From the results, students whose parents are poultry farmers have 15.9% probability of deciding to engage in broiler value chain activities after

graduation and this was significant at 1% (Coef. = 0.434 with P>z = 00.002). This could be because students see themselves as successors of their parent's business. Hence, will decide to engage in a similar activity after school to help in sustaining the business for generations. This agrees with what was reported by Mabe et al. (2020) in their study of MASO youth in cocoa value chain activities. The authors found that all the various cocoa value chain activities individual youths were involved in were actually those their parents were also undertaking.

This notwithstanding, the finding contradicts what has been reported by Sumberg and Okali (2013) that rural parents in agriculture and agribusiness tend to discourage their children from taking after their vocation. Similarly, parents who have attained higher education were less likely to allow their children to venture into agribusiness (Bosompem et al., 2017). On the contrary, Magagula and Tsvakira (2020) reported in their study on how the perception of the youth of Nkomazi municipality in South Africa directs their individual entrepreneurial decisions and found that financial support from parents was statistically significant and influences the intention of a youth to participate in agripreneurship.

Perceived knowledge in broiler value chain activities, was found to be positive and significantly at 10% (Coef. = 0.248 with P>z = 00.098). This indicates that students who have knowledge in broiler value chain activities has 9.1% probability of engaging in activities of the broiler value chain after school as a business or vocation. Salvago et al. (2019) reported that knowledge in farming practices was one of the factors influencing the youth of Catolonia region in Spain to farm or not to farm. Having skills or knowledge in

agribusiness was found to be a factor that influence youth in Ethopian to undertake agribusiness (Tarekegn et al., 2022). Similarly, Mulema et al. (2021) also found that having knowledge and skills in agriculture motivated the youth of Vietnam and Zambia to take up agriculture as a vocation.

Relationship among Broiler Value Chain Activities

The second and final aspect of objective five (5) entailed identifying the predictors of choice of broiler value chain activity a final year undergraduate student would choose to undertake after graduation as a business or vocation using the Multivariate Probit (MVP) Model. Table 64, presents the results of a pairwise correlation matrix which indicates the kind of relationship that exist between the 6 categories of broiler value chain activities.

Table 64: Correlation Matrix of Broiler Value Chain Activities

	Input production and Distribution	Broiler Production Activities	Broiler Processing Activities	Marketing of broiler Activities	Waste Management Activities	Provision of Support Services
Input Production and Distribution	1					
Broiler Production Activities	0.0607 (0.2053)	1				
Broiler Processing Activities	-0.0707 (0.1402)	0.2185 (0.000)	1			
Marketing of Broiler Activities	-0.0559 (0.2439)	0.16800 (0.0004)	0.093 (0.0519)	1		
Waste Management Activities	0.0339 (0.4800)	0.1838 (0.0001)	0.1028 (0.0317)	0.2240 (0.000)	1	
Provision of Support Services	0.0508 (0.2893)	0.1268 (0.0079)	0.0915 (0.0561)	0.2221 (0.000)	0.2414 (0.000)	1

Source: Field Survey, Tuoho (2022).

The log likelihood ratio test which was statistically significant at 1% (chi^2 (15) = -2053.4875; Prob > chi^2 0.0005) indicates that the independence of the error term of the broiler value chain activities in this study is rejected. This implies that there is the existence of mutual interdependence among broiler value chain activities considered in the study and culminates in a rejection of a separate probit model for each of the broiler value chain activity. Overall, the results of the test shows a joint significance that justifies the choice of the MVP model.

The correlation between all the dependent variables was significant except the correlation between input production and distribution and all the other dependent variables. Students' decision to involve in broiler processing activities was positively correlated with the decision to involve in broiler production activities. This implies that a student who decide to engage in broiler processing activities as an entrepreneurship venture after school is likely to couple it with broiler production activities. This indicates that students who decide to engage in broiler processing will integrate it with broiler production. Similarly, marketing of broiler activities positively correlated with broiler production and broiler processing activities implying that students who decided to engage in broiler marketing activities after school would integrate it with broiler production and broiler processing activities.

Also, the association between waste management and broiler production, processing and marketing activities was positive, suggesting that waste management activities has a complementary relationship with broiler production, processing and marketing activities. These activities are complementary because they each generate some form of waste which can

either be sold as by-product or be disposed and hence students who engage in either broiler production, processing or marketing would combine that with waste management. This is to either gain some form of income or reduce the impact of the waste on the environment by engaging in some form of waste management activities to ensure safe disposal. With regards to provision of support services and other activities except input production, the relationship is similar to that of waste management, positively correlated. The highest correlation among the dependent variables (24%) was between provision of support services and waste management while the lowest correlation (6%) was between broiler production and input production and distribution activities.

Drivers of Students' Choice of Broiler Value Chain Activity to Engage in After Graduation

The Multivariate Probit Model was used, to predict student's choice of broiler value chain activity to engage in and the results presented in Table 65. The results revealed that being a male (1= male) positively influences a student's choice to engage in broiler value chain activities. This was significant at 5% for both broiler production (Coef. = 0.281 with SE = 00.12) and marketing of broiler (Coef. = 0.302 with SE = 0.13) activities.

Table 65: Drivers of Students' Choice of Broiler Value Chain Activity to Engage in After Graduation

Variable	Inputs Production and Distribution		Broiler Production Activities		Broiler Processing Activities		Marketing of broiler Activities		Waste Management Activities		Provision of Support services	
	Coeff.	**SE**	**Coeff.**	**SE**	**Coeff.**	**SE**	**Coeff.**	**SE**	**Coeff.**	**SE**	**Coeff.**	**SE**
Sex (1 = male)	0.192	0.118	**0.281****	0.12	0.129	0.125	**0.302****	0.13	0.114	0.126	0.173	0.123
age	0.033	0.021	**0.059*****	0.02	**0.047****	0.021	0.016	0.021	**0.048****	0.021	**0.043****	0.020
Household size	-0.004	0.015	-0.005	0.015	-0.021	0.016	0.014	0.015	0.002	0.016	0.007	0.015
Place of residence (1=urban)	-0.127	0.137	-0.133	0.134	-0.047	0.14	-0.212	0.139	-0.048	0.139	**-0.318****	0.136
Place of residence of parents (1=urban)	0.095	0.136	-0.01	0.136	0.014	0.142	-0.076	0.141	0.121	0.141	0.152	0.139
Parents are farmers (1=yes)	0.101	0.125	-0.078	0.123	-0.133	0.128	0.1	0.126	0.107	0.126	-0.069	0.125
Parents are poultry farmers (1=yes)	**0.312****	0.136	**0.349*****	0.128	**0.412*****	0.132	**0.414*****	0.13	**0.268****	0.129	**0.234***	0.127
Engages in economic activity (1=yes)	-0.036	0.105	0.02	0.103	-0.088	0.109	0.057	0.108	**0.237****	0.105	**0.174***	0.104
Perceive Poultry industry to lack Government support	-0.043	0.106	-0.072	0.105	0.014	0.11	0.162	0.111	-0.049	0.11	0.041	0.108
Perceive Economic conditions not favourable for the poultry industry	-0.14	0.124	-0.005	0.124	0.071	0.128	-0.031	0.129	-0.088	0.128	-0.092	0.126

Table 65: Continue

Perceive Resource availability to be difficult	-0.005	0.104	0.003	0.103	-0.024	0.108	-0.016	0.108	0.05	0.107	-0.036	0.104
Perceive Broiler production not sociocultural sound	0.158	0.217	0.116	0.205	0.301	0.21	-0.013	0.214	0.161	0.21	-0.002	0.208
Peceived poultry to involve high risk	0.05	0.108	0.06	0.107	-0.041	0.112	**-0.236****	0.112	-0.16	0.111	-0.009	0.109
Perceived high capital requirement to start poultry business	0.096	0.113	**0.249****	0.113	0.04	0.118	0.062	0.119	0.153	0.117	0.012	0.115
Knowledge on specific value chain activity	**0.177***	0.078	0.07	0.05	0.033	0.048	**0.086***	0.047	0.069	0.062	**0.130****	0.064
_cons	-1.214	0.531	-2.324	0.505	-1.939	0.534	-1.574	0.522	-2.389	0.519	-2.095	0.519
Multivariate probit (MSL, # draws) 5												
Number of obs 728												
Wald $chi^2(90)$ 140.58												
Log likelihood -2053.4875												
Prob > chi^2 0.0005												

***, ** and * indicate significance at 1, 5 and 10% respectively. 1 = Strongly disagree, 2 = Disagree, 3 = Somewhat agree, 4 = Agree and 5 = Strongly agree. Field survey, Tuoho (2022).

This implies that male students are more likely to undertake broiler value chain activities compared to females. This result agrees with the findings of Ng'atigwa et al. (2020) who reported that female youth were less likely to choose horticulture agribusiness in Tanzania. Similarly, a study conducted in Zambia and Vietnam reported more male youth participating in agriculture and agribusiness compared to female youth who were mostly salary employees (Mulema et al., 2021).

Also, the results revealed that age positively influences engagement in broiler value chain activities. This implies that an increase in age increases the probability of a student choosing to engage in broiler value chain activities. This was significant at 1% for broiler production activities (Coef. = 0.059 with SE = 0.02) and 5% for processing, waste management, and provision of support services activities (Coef. = 0.047 with SE = 0.021, Coef. = 0.048 with SE = 0.021, Coef. = 0.043 with SE = 00.02) respectively. This finding is consistent with what was reported by Mabe et al. (2020) that increase in the age of youth influences their choice of a cocoa value chain activity to engage in.

Per the results, it was further revealed that residing in urban areas negatively influenced the choice of students to engage in some broiler value chain activities. This can be construed as students who reside in urban areas are not likely to go into broiler value chain activities. This could probably be because of the issues with the acquisition of land in the cities for their business, especially as start-ups since the cost of land is outrageous in these areas. However, this was only significant at 5% for involvement in the provision of support services (Coef. = -0.318 with SE = 0.136). Adequate

access to land is a major driver of young people's choice to engage in the livestock sector as a vocation in Spain's, Catolonia region (Góngora, et al., 2019). Land access was also found to negatively influence youth participation in horticultural agribusiness in Tanzania (Ng'atigwa et al., 2020).

This finding disagrees with what was reported by Bosompem et al. (2017) who reported that students who lived in farming communities for a long time were less likely to start an agribusiness after graduation. Similarly, Sumberg et al. (2017) reported that due to lack of social services and facilities in rural areas where most farming activities take place, young people from these areas always move to urban areas to look for different forms of work instead of farming or engage in agriculture-related jobs. Similarly, Sumberg, and Okali (2013) have argued that there is a long-standing evidence that rural parents and young people hold agriculture in low esteem, parents, therefore, educate their children to enable them to get jobs in the formal public or private sectors to avoid farming.

The results also revealed that students who were engaged in economic activities were positively influenced at a significant level of 5% and 10%, to choose waste management activities (Coef. = 0.237 with SE = 0.105) and provision of support services (Coef. = 0.174 with SE = 0.104) respectively, to engage in after graduation. This implies that students who are already engaged in any economic activity are likely to engage in either waste management activities or provision of support services or both. This disagrees with the findings of Bosompem et al. (2017) who reported that students who were involved in economic activities such as farming at home were likely not to undertake agribusiness after graduation. However, Shayo (2020), reported that

youth in Tanzania who have experience in agriculture in various ways were more likely to choose to undertake a career in agriculture than those who did not.

Parent involvement in poultry production positively influenced students' choice to engage in broiler value chain activities. For broiler production (Coef. = 0.349 with SE = 0.128), and processing activities (Coef. = 0.412 with SE = 0.132), and marketing of broiler activities (Coef. = 0.414 with SE = 0.13) these were all significant at 1% while for input production and distribution (Coef. = 0.312 with SE = 0.136) as well as waste management (Coef. = 0.268 with SE = 0.129) activities it was significant at 5%. Moreover, for the provision of support services (Coef. = 0.234 with SE = 0.127), this was significant at 10%. Parents' involvement in poultry production influencing students' engagement in broiler value chain activities was not surprising since these students have seen their parents being rewarded for their hard work. At the same time, the income made from this activity is being used to take care of them and they also see their parents as role models and possible heir apparent to these businesses.

Similar findings have been reported by Salvago et al. (2019) who found that parent farming systems influence the willingness of their children (youth) to farm or not to farm. Additionally, Mabe et al. (2020) also reported that there was a positive and significant influence of the occupation of parents on the choice a youth make on the type of cocoa value chain activity to undertake. Whiles Góngora, et al. (2019) reported that the absence or presence of an agrarian family tradition was one of the drivers that determine the

involvement or joining the livestock sector as a worker or entrepreneur by young people in Spain.

Perceiving poultry production to require high capital positively influenced the engagement of students in broiler value chain activities. This implies that students who perceived that poultry production requires high capital are likely to enter any of the broiler value chain activities. However, this only influenced engaging in broiler production at a 5% significance level (Coef. = 0.249 with SE = 0.113). This could be because students have already saved enough to engage in this activity or probably seek funding when they enter this activity and hence, they do not see the high capital requirement to be a hindrance to their involvement.

Shayo (2020) reported that capital availability is one of the critical incentives that shaped the choice of youth to venture into agriculture and entrepreneurship. Similarly, Umeh et al. (2020), Nmeregini et al. (2020) and Tarekegn et al. (2022) have all reported on how capital influences the choice and involvement of the youth of Nigeria and Ethiopia in agribusiness respectively.

Perceiving poultry production to involve high risk negatively influenced the choice of students to engage in broiler marketing activities after graduation, and this was significant at 5% (Coef. = -0.236 with SE = 0.112). Risk factors in the domestic broiler value chain include bird flu disease outbreaks, which directly affects the ability of marketers of broilers to sell, since the disease is of zoonotic importance people shy away from chicken meat any time there is an outbreak of the disease. Hence, the decreased

probability of students to engage in broiler value chain activities such as marketing after graduation as a vocation (Aning et al., 2008).

This is because students are risk averse and would probably not invest in businesses with such a high risk. This finding is consistent with what was reported in earlier studies which identified the perceived high risk in agriculture and agribusiness ventures as the major factor keeping young people away from participating in agricultural value chains as a vocation (Salvago et al., 2019). Similarly, Magagula and Tsvakirai (2020) also reported that the youth of Nkomazi municipality in South Africa were risk averse to the extent that they were only ready to undertake agripreneurship if they were provided with 50% of the initial capital required to start the business to cushion them against the high risk in the agricultural sector.

Also, knowledge of specific value chain activities positively influenced students' choice be engage in these activities. This implies that students who have good knowledge of specific value chain activity have a higher probability of engaging in that activity after school. However, this was only significant at 10% and for input production and distribution (Coef. = 0.177 with SE = 0.078) and marketing activities (Coef. = 0.086 with SE = 0.047) respectively, but at 5% for the provision of support services (Coef. = 0.130 with SE = 0.064).

This finding agrees with Mulema et al. (2021) who reported that having agricultural skills positively influences the choice of Zambian youth in taking up agriculture as a vocation. On their part, Salvago et al. (2019) reported that knowledge of farming practices was a major driver of youth willingness to farm. Similarly, youth who studied agriculture either in secondary school or tertiary has been reported to be influenced positively,

hence do have the intention to participate in agripreneurship than those who did not (Magagula & Tsvakirai, 2020). Additionally, Anyidoho et al., (2012), Góngora, et al. (2019), and Sumberg et al. (2012) have also conceded that knowledge and skills are critical driving factors which underscore willingness and ability of young people to be involved in agriculture.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Introduction

The purpose of this study was to analyse the performance and challenges of the domestic broiler value chain and its implication for agricultural graduate employment in Ghana. This chapter provides summary of the findings and conclusions of the research, and where possible recommendations are made, to improve the profitability of the economic activities of the domestic broiler value chain as a precursor to attracting the youth to take up an activity along the chain as a career.

Study Summary

Broiler value chain activities are private sector led, and a key ingredient for national economic growth and also critical in not only providing nutritional and economic security to the nation but also making available sustainable jobs for the growing unemployed young population. It is for this reason that this study was carried out to map and identify the challenges of Ghana's' broiler value chain and analyse the profitability and employment potential of key activities of the chain. At the same time find out why the youth of Ghana would engage or not engage in the chain activities as a vocation.

To this end, the study used the mixed method of the concurrent nested strategy model research design to collect cross sectional data (quantitative and qualitative) from feed millers, broiler producers, poultry processors, live bird sellers or marketers in the Greater Accra, Ashanti, and Bono regions as well as final-year undergraduate students in UCC, KNUST, UENR and AAMUSTED.

Simple random sampling technique was used to select a sample of 345 broiler producers from a total population of 485 based on the Krejcie and Morgan (1970) sample determination table in the three study regions. However, the census method was employed in the selectionof 70 feed millers, 40 poultry processors, 123 live bird sellers or marketers due to their population size. Similarly, the census method was also used to select the 1129 final-year undergraduate students from four public universities, who were studying agriculture and agriculture-related programmes.

The data was collected using structured interview schedules and questionnaire that comprised open-ended and close-ended questions. These interview schedules and questionnaire were content validated and pre-tested. The collected data were then coded and entered into excel spread sheets and cleaned to eliminate errors and rectify issues of missing data. The analysis was then done using the SPSS version 28.0 and Stata version 17.0 software.

Statistical analysis of the data was done using descriptive statistics including frequencies, percentages, means and standard deviations as well as inferential statistics including ANOVA, stochastic frontier translog profit function model, probit and multivariate probit regression models. The value chain mapping system was employed to identify key broiler value chain actors and the SWOT matrix was adopted to ascertain the strengths, weakness, opportunities and threats of the chain in the study area. The challenges actors associate with the domestic broiler value chain was analysed with using Kendall's coefficient of concordance which enabled chain actors to ranked their challenges or constraints in order of importance. The key findings of the study, therefore, are as follows.

Study Key Findings

Feed mills were found to be producing averagely 7.07 Mt per week instead of their average installed capacity of 10.64 Mt per week. While broiler producers with capacity to produce 2356.14 birds per cycle were producing 644.16 birds per production cycle. Similarly, live bird sellers with capacity to hold and sell 371.27 birds per day were holding 42.14 birds and selling 19.14 birds per day.

Broiler value chain actors' source of selected production inputs was mostly foreign, 56% of broiler producers were buying and using imported DOCs. Similarly, 51% of the equipment's broiler producers were using are imported. Additionally, feed millers' sources of soybean and maize were mostly foreign. While all feed additives, veterinary vaccines and drugs were also imported.

On the mapping of the broiler value chain in the study area. It was found that among the distribution pathways or channels, the shortest involved three actors while the rest have four or five actors. The map shows an extended broiler value chain in the study area as there are many links "manifold links" in the chain. A demonstration of some degree of vertical integration was observed among some actors in the chain, thus some actors control more than one activity of the chain. Subsequently, the findings noted 13% of broiler producers operated their own feed mills purposely for their farms, while 31.1% of them (broiler producers) were producing under contract for integrators. Another key observation was that 28% of the broiler producers also processed and sell the dressed birds to consumers as such control the

processing and marketing component of the chain in addition to their production activity.

The foremost production and marketing challenges of the actors were as follows: for feed millers it was price volatility of maize and soybeans, and pricing difficulties for their products. Broiler producers ranked high feed cost and competition from cheap poultry meat imports. While poultry processors ranked high cost of live birds (raw materials) and access to current market information. However, live bird sellers ranked high cost of transportation as their number one challenge.

On gross profit and profit share among broiler value chain actors, broiler producers received the highest of GH¢ 28.4 (36.6%), followed by live bird sellers GH¢ 28.2 (36.4%) and poultry processors GH¢ 20.9 (27.0%).

The Translog profit function model results on profit efficiency of broiler producers revealed that the cost of feed, and vaccine and drugs, were statistically significant and increases their profitability while, other cost and miscellaneous cost were also statistically significant but decrease the profitability of broiler businesses. The mean profit efficiency score for broiler producers was 62.9%.

The predictors of profit inefficiency in broiler production were formal education level and ever access credit which were both statistically significant and reduces profit inefficiency among broiler producers while family labour and extension service [veterinary and animal husbandry services] (number of contacts) were also statistically significant but increases profit inefficiency of broiler producers in the study area.

However, among live bird sellers the cost of birds and labour were all statistically significant and increases the profitability of live bird sellers. Whiles other cost also was statistically significant but with a negative coefficient, hence reduces the gross profit of live bird's sellers in the study area. The mean profit efficiency score among live bird sellers was 34.4%. The main source of inefficiency among live bird sellers was sex which was statistically significant and this was found to reduce profit inefficiency among live birds' sellers while age, educational level, ever access credit and household size were statistically significant but increase profit inefficiency among live bird sellers in the study area.

Poultry processors profit efficiency was determined by cost of birds which was statistically significant and increases their profit efficiency. However, other cost was also statistically significant but reduces the profit efficiency of poultry processors. The mean profit efficiency of poultry processors in the study area was 79.9%. Among poultry processors household size and level of education were found to be statistically significant and increases their profit inefficiency while, age and ever access credit were also statistically significant but deceases profit inefficiency among poultry processors in the study area.

Among all the broiler production activities that students perceived knowledge level was measured across universities and programmes of study, the overall index or mean score was 2.08 (good perceived knowledge). However, on specific activities the lowest mean score was on generating electricity from broiler droppings 1.61 while the highest mean score of 2.51 (very good perceived knowledge) was on live birds selling.

Across university comparison of the composite mean score of students perceived knowledge in broiler value chain activities show that UENR students scored the highest mean of 2.27 for inputs production and distribution activity. While for broiler production activities the highest mean score of 2.40 was obtained by students of AAMUSTED. On broiler processing activities UCC students scored the highest mean of 2.58. Again, the marketing of broiler activities had UCC students scoring the highest mean of 2.72. Whereas UENR students scored the highest mean of 2.01 on the waste management activities. Additionally, the highest mean score of 2.40 was obtained by the students of UENR on the provision of support services.

The perceived knowledge level of students was also compared on programme basis per specific broiler value chain activity and the mean scores are as follows; the highest mean score of 2.36 was obtained by agro-processing students on inputs production and distribution activity. The broiler production activities highest mean score of 2.52 was obtained by animal science students. On broiler processing activities, agro-processing students scored the highest mean of 3.50. Similarly, agro-processing students scored the highest mean of 2.73 in the marketing of broiler activity. While crop science students scored the highest mean of 1.96 on the waste management activity. Provision of support services had agro-processing students recording the highest mean score of 2.30.

A determination of statistically significant differences across universities in the perceived knowledge level of students in broiler value chain activities using ANOVA found that there were statistically significant differences in the following activities; inputs production and distribution F (3,

658) = 4.669, *p = 0.003,* marketing of broiler activities F (3, 654) = 4.173, *p = 0.006,* and provision of support services F (3, 654) = 5.165, *p = 0.002*. However, when the test of significance was conducted for the various programmes of study (across programmes) by students only broiler production activities was statistically significant F (6, 648) = 2.465, p = 0.023.

The overall perception index of the students on all the four constructs was 3.02 (somewhat agree or neutral), however, this was not so on the individual constructs. The overall perception index for the construct government policy perceptions recorded an overall index of 3.46 which implies that students agree that current government policies do not support or favour the growth of broiler value chain businesses and may affect their decision to participate in broiler value chain activities after graduation. The individual statement with the lowest mean score of 1.52 was "broiler production is for school dropouts and illiterates" the score implies students disagreed with the statement. While the individual statement with the highest mean score of 3.96 was "High feed cost would affect the business turn over (profitability)" of broiler producers by the score students agreed to the statement.

The across university comparison of the overall perception index of the four constructs was done for the four universities and it showed that for the socio-cultural perception, UENR had the highest index of 2.23 implying they disagree that there were negative socio-cultural perceptions that can affect their engagement in the broiler value chain. On the economic perceptions construct overall index, KNUST students recorded the highest of 3.38 this is more tilted toward agreeing that the prevailing economic situation in the

country is adversely affecting broiler value chain businesses and would affect their decision to engage in the value chain economic activities after graduation.

The overall perception index on the government policy perceptions construct show that KNUST and AAMUSTED students recorded the highest index of 3.49 which implies that they agree that current government policies if they exist at all are inimical to the growth of the domestic broiler value chain businesses and may affect their choice of broiler value chain activities as a vocation after graduation. Resource availability perception construct had KNUST students scoring the highest index of 3.25. This score suggest KNUST students were tilting toward agreeing to the statement that the perceived absence of resources that would enable them to start a broiler value chain activity as a business after graduation would affect their choice of broiler value chain as an area to venture into.

When the construct overall index was compared based on programmes of study (across programmes) by students. The socio-cultural perceptions constructs' highest mean score of 2.19 was recorded by students offering agribusiness. This index show they disagree that there were negative socio-culture perceptions affecting the engagement of youth in broiler value chain activities as a vocation.

On the government policy perceptions, agricultural economics students obtained the highest overall index of 3.53. This means that the agricultural economics students agree that there are no government policies that create the right enabling environment for the growth of broiler value chain businesses in the country and this may affect their decision to take up broiler value chain

activities as business after graduation. The resource availability construct had student's of agribusiness scoring the highest mean of 3.25 which is tilted towards agreeing with the statement.

An across-university comparison using ANOVA to determine if there were statistically significant differences between students on the various perception constructs towards engaging in broiler value chain activities shows statistically significant differences in the economic perceptions F (3, 724) = 4.747, p = 0.003 and government policy perceptions constructs F (3, 724) = 3.327, p = 0.019. However, across programmes of study by students' comparison found statistically significant differences only in the construct social-cultural perception F (6, 721) = 2.985, p = 0.007.

The determinants of final year undergraduate student's decision to engage in broiler value chain activities (poultry production) were predicted by a probit regression model to include sex [1 = male] (Coef. = 0.303 with P>z = 00.09), parents engaged in poultry production activities (Coef. = 0.406 with P>z = 00.004) and having knowledge in broiler value chain activities (Coef. = 0.248 with P>z = 00.098) where all statistically significant and positively influence students' choice to engage in the broiler value chain.

The results of a multivariate probit (MVP) regression model also reveal that the drivers of the choice of a specific broiler value chain activity a final year undergraduate student would choose to undertake after graduation as a vocation were driven by the following variables that were found to be statistically significant. Sex (1 = male) influences the choice of broiler production activities (Coef. = 0.281 with SE = 00.12) and marketing of broiler activities (Coef. = 0.302 with SE = 00.13). While age influence choices in

broiler production activities (Coef. = 0.059 with SE = 00.02) as well as processing, waste management, and provision of support services activities (Coef. = 0.047 with SE = 0.021, Coef. = 0.048 with SE = 0.021, Coef. = 0.043 with SE = 00.02) respectively.

The results also show that residing in urban area negatively influenced the choice of a students to engage in the provision of support services activity (Coef. = -0.318 with SE = 00.136). Students who were engaged in an economic activity were also positively influenced to choose waste management activities (Coef. = 0.237 with SE = 00.105) and provision of support services activities (Coef. = 0.174 with SE = 00.104) respectively.

Parents' involvement in poultry production positively influenced their children (students) to choose to engage in broiler production activities (Coef. = 0.349 with SE = 00.128), processing activities (Coef. = 0.412 with SE = 00.132), and marketing of broiler activities (Coef. = 0.414 with SE = 00.13), input production and distribution activities (Coef. = 0.312 with SE = 00.136) as well as waste management activities (Coef. = 0.268 with SE = 00.129) and the provision of support services activities (Coef. = 0.234 with SE = 00.127).

Perceiving poultry production to require high capital positively influenced students in choosing to engage in broiler production activities (Coef. = 0.249 with SE = 00.113). Having knowledge on specific value chain activity positively influenced students' choice to engage in it. These includes input production and distribution activities (Coef. = 0.177 with SE = 00.078), marketing activities (Coef. = 0.086 with SE = 00.047) and provision of support services activities (Coef. = 0.130 with SE = 00.064). However, perception about poultry production to involve high risk negatively influenced

the choice of students to engage in broiler marketing activities after graduation (Coef. = -0.236 with SE = 00.112).

Study Conclusions

In view of the findings, the study conclusions are as follows.

1. All the actors of the broiler value chain were operating below capacity, broiler producers were operating as small-scale producers since they were producing only 27% of their normal capacity, while feed millers were doing 66%, live bird sellers were just operating at 11% of their normal capacity.
2. Major broiler production inputs were imported from abroad as 56% of producers were depending on importation for DOCs, 51% for production equipment's while feed ingredients, soybean and maize as well as feed additives, vaccines and veterinary drugs were all imported.
3. The broiler value chain map of the study area shows the existence of vertical integration in the activities of few broiler producers. Which is confirmed by 13% of broiler producers having feed mills as part of their production system, while 31.1% of broiler producers are contracted to produce for integrators. Similarly 28% also have a processing as part of their production system.
4. The production and marketing challenges confronting actors in the feed milling business were the price volatility of maize and soybean, and the difficulties in pricing their products for sale. While broiler producers were confronted with high feed cost and competition from cheap poultry meat imports. In the case of poultry processors, it was the high cost of live birds and the lack of access to current market

information. However, for live bird sellers, their main challenge was the high cost of transportation.

5. The activities of broiler producers, live bird sellers, and poultry processors were profitable.
6. The cost of feed and vaccines and drugs increases the profit of broiler producers while other cost and miscellaneous cost decreases their profit. Also, broiler producers who have a formal education level, and have ever accessed credit as well as being a member of poultry farmers associations are more profit efficient. However, broiler producers who use family labour and have contacts with extension services [veterinary and animal husbandry services] (number of contacts) are profit inefficient.
7. Live birds' sellers in the study area profit efficiency were increased by the cost of bird and labour cost, these make live bird selling profitable but, other cost reduces their profit. Male live bird sellers were more profit efficient than females, while live bird sellers who are older in age, have attained some levels of education, and have ever-accessed credit are also more profit inefficient compared to those who did not.
8. The cost of birds made poultry processing profitable but other cost reduces the profitability. However, household size increases profit inefficiency among poultry processors whiles age, level of education, and ever-accessing credit decrease profit inefficiency among them.
9. The measured students perceived knowledge level across universities and programmes of study on major broiler value chain activities was good with overall mean score of 2.08.

10. Across programme comparison of the perceived knowledge level of students in broiler value chain activities found animal science students to have very good knowledge of broiler production activities.
11. The perceived knowledge level of students in broiler value chain activities across the study universities was statistically significantly different in inputs production and distribution activities, marketing of broiler activities, and provision of support services activities. While across programmes was only statistically significantly different in broiler production activities.
12. The overall perception of students on the issues that would keep them away from engaging in broiler value chain business after school was somewhat agree with overall mean score of 3.02. However, students agreed that high feed cost would affect the business turn over (profitability) of broiler producers.
13. Students agreed that current government policies and the state of the country's' economy do not support or favour the growth of broiler value chain businesses, which may affect their decision to participate in broiler value chain activities after graduation.
14. There were statistically significant differences in the perception of students across universities studied on how national economic challenges and government policy toward the broiler value chain would influence their decision to engage in it. These differences also existed across the different study programmes of students in the social-cultural perception construct.

15. The determinants of the decision of a student to choose to undertake an agribusiness venture in the broiler value chain after school is informed by any one of these; the student is a male, has a parent who is into poultry farming, and has knowledge on broiler value chain activities.
16. At the same time, the drivers of the choice of a student to undertake a given broiler value chain activity as a vocation after graduation were; input production and distribution, a student would choose it if either their parents were into poultry farming or if they have knowledge in that area or specific activity. For broiler production activities, a student would choose it if either they are males, older than the rest, their parents are poultry farmers, or the capital required to start is high. To choose a poultry processing activity, then the student is a bit older in age or the parents were poultry farmers. For marketing of broiler activity, for a student to choose this activity then, the student is either a male, has parents who are poultry farmers, and also have knowledge in marketing, but the student who perceived poultry to be a high-risk business would not choose the marketing of broiler activity. For a student to choose the waste management activity, either the student's parents are poultry farmers, or the student is already involved in some form of economic activity. Student who would choose to undertake a venture in the provision of support services, would either be a bit older in age than the average student age, have parents who are poultry farmers, are engaged in economic activity, and have knowledge in the area he or she wants to provide the support services. However, a

student would not choose the support service activity if he or she is residing in an urban area.

Study Recommendations

1. Broiler producers should work towards vertically integrating their businesses to increase their productivity.

2. To address the challenges and take advantage of the opportunities of the local broiler value chain, the government of Ghana and other stakeholders should:

- Reduce the over dependence on importation of poultry production inputs, through investing in public private partnerships to produce and distribute broiler and other poultry production inputs in the country.

- Find a practical solution to increasing the yield of maize and soybean to create room for both human and poultry feed demand. This may include the use of draught resistant seeds that require little soil fertility for productivity while devising mechanisms to increase adoption rate among farmers.

- Explore the introduction of mobile poultry processing unit in wet markets and poultry producing clusters in the country. This can be done as a public private partnership to make available funding to procure these processing equipment's. It would make available processed dressed whole bird and chicken cuts or parts to satisfy the Ghanaian consumer whose chicken consumption is influence by convenience and cut parts.

- Develop and implement local content policy for the domestic broiler value chain. To ensure that international restaurants, food joints, hotels and shopping malls operating in the country procure the chicken they use from local producers and processors.

3. To increase the profitability in the broiler value chain there is the need for:

- Broiler value chain actors particularly producers should be encouraged by stakeholders to engage or control more than one activity of the chain to maximise their profit share of chain activities.

- Government to help make available the appropriate technologies (e.g. DOCs with high feed conversion ratio, increased access to credit) to enable actors to produce and market their produce at competitive prices.

4. To improve the knowledge level of students' while enabling them to appreciate the various aspects of the agri-food chain. Agriculture, and agriculture-related programmes of study in Ghanaian universities should be designed based on the value chain concept with a practical approach to teaching and learning.

5. To change the perception of the youth and encourage graduates from the countries universities who have studied agriculture to engage in activities of the broiler value chain as vocation:

- Government should ensure national macro and micro economic stability that impact positively on the growth of agribusinesses

particularly broiler value chain businesses. Since the students have demonstrated through the study that their perception to engage in the broiler value chain after graduation is shaped more by the state of the national economy, government policies aimed at creating the enabling business environment and social and cultural issues.

- Also, a comprehensive national policy and action plan on the development of the broiler value chain is urgently needed for the country. To guide and create the enabling environment for the development of the broiler value chain.
- A special program by government that address access to land and risk mitigation policies such as insurance for starts-ups should be considered to woo university graduates into broiler value chain business as a vocation.
- Government and development partners should create the opportunity for continuous access and provision of knowledge and skills in broiler value chain activities to the youth.

6. Any program of government or development partners that is aimed at getting the youth to choose broiler value chain economic activities as a business or vocation to engage in must focus the inclusion criteria on either.

- Youth who have the knowledge and skills in specific broiler value chain activities.
- The gender and age of the individual youth.

- Youth whose parents are already undertaking activities on the poultry or broiler value chain.

Areas of Further Studies

- Further studies is recommended in price determination of products and services along the domestic broiler value chain

REFERENCES

Abington-Cooper, M. (2005). An evaluation of the LSU Agricultural Center's agricultural leadership development program, 1988-2004 (Doctoral dissertation, Northeast Louisiana University).

Abro, Z., Kassie, M., Tanga, C., Beesigamukama, D., & Diiro, G. (2020). Socio-economic and environmental implications of replacing conventional poultry feed with insect-based feed in Kenya. *Journal of Cleaner Production*, *265*, 121871. https://doi.org/10.1016/j.jclepro.2020.121871

Adei, D., & Asante, B. (2012). The Challenges and Prospects of the Poultry Industry in Dormaa District. *Journal of Science and Technology (Ghana)*, *32*(1), 104–116. https://doi.org/10.4314/just.v32i1.11

Afful, O. A. (2019). *Determinants of Career Choice Among Students in Public Senior High Schools in the Asikuma-Odoben Brakwa District*. University of cape coast.

African Union Commission. African Youth Charter. , 5 African Union Commission § (2006).

Agbim, K. C., Oriarewo, G. O., & Owocho, M. (2013). Factors influencing entrepreneurial intentions among graduates of Nigerian tertiary institutions. *International Journal of business and management invention*, *2*(4), 36-44.

Agbor, J., Taiwo, O., & Smith, J. (2012). Sub-Saharan Africa's Youth Bulge: A Demographic Dividend or Disaster? *The Brookings Institution*, pp. 9–11. Retrieved from http://goo.gl/9F9iSU

Agiomirgianakis, G., Voulgaris, F., & Papadogonas, T. (2006). Financial factors affecting profitability and employment growth: the case of Greek manufacturing. *International Journal of Financial Services Management*, *1*(2/3), 232. https://doi.org/10.1504/ijfsm.2006.009628

Ahmed, I., Aamir, M. & Ijaz, H.A., 2011. External factors and entrepreneurial career intentions; moderating role of personality traits. *International Journal of Academic Research*, 3(5), pp.262–268.

Aigner, D., Lovell, C. A. K., & Schmidt, P. (1977). Formulation and estimation of stochastic frontier production function models. *Journal of Econometrics*, *6*(1), 21–37. https://doi.org/10.1016/0304-4076(77)90052-5

Akinwumi, J., Okike, I., Bett, B. K., Randolph, T., & Rich, K. (2012). *Analyses of the Poultry Value Chain and Its Linkages and Interactions with HPAI Risk Factors in Nigeria Upgrading the Nicaraguan dual purpose value chain through system dynamic modelling View project*. https://www.researchgate.net/publication/265106943

Akoto, O. A. (2019). *Rearing For Food and Jobs A Campaign to Stimulate Rapid Growth of the Ghanaian Livestock Sector* (Issue April).

Akpan, S, B. (2010). *Encouraging Youth's Involvement in Agricultural Production and Processing*. *29*, 10. https://agrilinks.org/sites/default/files/resource/files/Youth Involvement in Ag Production - IFPRI.pdf

Aleskerov, F., Bouyssou, D., & Monjardet, B. (2007). Utility maximization. In *Microeconomic Theory second edition* (2nd ed.). Springer. https://doi.org/10.4324/9780203098356-8

Al-Hassan, R. M., Larvoe, N., & Adaku, A. A. (2014). Hedonic price analysis of dressed chicken in Ghana. *International Journal of Business and Social Science*, *5*(12), 215–223. Retrieved from www.ijbssnet.com

Ali, M., & Flinn, J. . (1989). Profit efficiency among Basmati rice producers in Pakistan Punjab. *American Journal of Agricultural Economics*, *71*(2), 303–310.

Allin, S., Dudevich, A., Gapanenko, K., Grignon, M., Harvey, J., & Veillard, J. H. M. (2012). Developing a Model for Measuring the Efficiency of the Health System in Canada. In *Canadian Institutes for Health Information* (Vol. 1, Issue October).

Amani, J. (2013). Social Influence and Occupational Knowledge as Predictors of Career Choice Intentions among Undergraduate Students in Tanzania. *International Journal of Learning & Development*, *3*(3), 185–193. https://doi.org/10.5296/ijld.v3i3.3990

Amanor-Boadu, V., Nti, F. K., & Ross, K. (2016). *Structure of Ghana's Chicken Industry in 2015* (Issue September). https://ghanalinks.org/documents/20181/0/Structure+of+Ghana%27s+Chicken+Industry+in+2015/74a81988-bf35-4948-ace9-153eea8bf7c5?version=1.0

Andam, K. S., Johnson, M. E., Ragasa, C., Kufoalor, D. S., & Das Gupta, S. (2017). *A Chicken and Maize Situation The Poultry Feed Sector in Ghana*. *January*.

Andam, K., & Silver, J. (2016). *Food Processing in Ghana* (No. 11; Vol. 11, Issue October).

Andam, K., Al-Hassan, R. M., Asante, S. B., & Diao, X. (2015). Is Ghana making progress in agro-processing? Evidence from an inventory of processed food products in retail shops in Accra. *IFPRI Working Paper 41, December*, 1–14.

Angioloni, S., Kostandini, G., Alali, W. Q., & O'Bryan, C. A. (2016). Economic feasibility of mobile processing units for small-scale pasture poultry farmers. *Renewable Agriculture and Food Systems*, *31*(5), 387–401. https://doi.org/10.1017/S1742170515000319

Animal Production Directorate. (2021). Information on imported livestock feed ingredients. Accra, Ghana.

Aning, K. G., Turkson, P. K., & Asuming-Brempong, S. (2008). *Pro-Poor HPAI Risk Reduction Strategies in Ghana - Background Paper* (Issue 2).

Anyidoho, N. A., Leavy, J., & Asenso-Okyere, K. (2012). Perceptions and Aspirations: A Case Study of Young People in Ghana's Cocoa Sector. *IDS Bulletin*, *43*(6), 20–32. https://doi.org/10.1111/j.1759-5436.2012.00376.x

Arbelo, A., Arbelo-Pérez, M., & Pérez-Gómez, P. (2021). Profit Efficiency as a Measure of Performance and Frontier Models: A Resource-Based View. *BRQ Business Research Quarterly*, *24*(2), 143–159. https://doi.org/10.1177/2340944420924336

Aryeetey, E. & Baah-Boateng, W. (2016). Ghana A Successful Growth Story with Job Creation Concerns. In F. Bhorat, Haroon Tarp (Ed.), *Africa's Lions* (pp. 77–108). Retrieved from https://www.jstor.org/stable/10.7864/j.ctt1hfr23q.6

Aryeetey, E., & Baah-boateng, W. (2015). WIDER Working Paper 2015 / 140 Understanding Ghana ' s growth success story and job creation challenges. *WIDER Working Paper 2015/140*, *December*, 1. https://doi.org/10.13140/RG.2.1.1856.1042

Asante-Addo, C., & Weible, D. (2019). Is there hope for domestically produced poultry meat? A choice experiment of consumers in Ghana. Agribusiness, 36(2), 281–298. https://doi.org/10.1002/AGR.21626

Asante-Addo, C., & Weible, D. (2020). Imported Versus Domestic Chicken Consumption in Ghana: Do Attitudes and Perceptions Matter? *Journal of International Food and Agribusiness Marketing*, *32*(5), 503–526. https://doi.org/10.1080/08974438.2020.1751767

Ashitey, E. (2017). 2017 Ghana Poultry Report. In *Global Agricultural Information Network*. Retrieved from https://gain.fas.usda.gov/Recent GAIN Publications/2017 Ghana Poultry Report Annual _Accra_ Ghana_5-23-2017.pdf

Atuahene, C. C. ., Attoh-Kotoku, V. ., & Mensah, J. J. (2010). Poultry production in Ghana Prospects and challenges. *Ghanaian Journal of Animal Science*, *5*(1), 92–97. https://doi.org/10.1007/s10681-013-1029-5

Ayieko, D. M. O., Bett, E. K., & Kabuage, L. W. (2014). An analysis of the efficiency of indigenous chicken marketing channels in Makueni County, Kenya. *Journal of Agricultural Economics and Development*, *3*(2), 26–034. http://academeresearchjournals.org/journal/jaed

Ayim-Akonor, M., Arthur, C., Afrane, O., & Baryeh, K. (2013). Infectious Bronchitis Virus: a major cause of respiratory disease outbreaks in chickens in Ghana. *Journal of Biology, …*, *3*(12), 56–61.

http://www.iiste.org/Journals/index.php/JBAH/article/view/7533

Ayisi, N. D., & Adu, K. J. (2016). Challenges and Future Prospects for Broiler Meat Consumption in Ghana. *Imperial Journal of Interdisciplinary Research (IJIR)*, *2*(8), 648–654.

Baah-Boateng, W. (2013). Determinants of Unemployment in Ghana. *African Development Review*, *25*(4), 385–399. https://doi.org/10.1111/1467-8268.12037

Babu, S. C., & Shishodia, M. (2017). *Applying Analytics , Typology , and Measurements to Africa* (Issue May). International Food Policy Research Institute. https://www.ifpri.org/publication/agribusiness-competitiveness-applying-analytics-typology-and-measurements-africa

Bank of Ghana. (2021). *Data on monetary value of imported chicken and chicken products*.

Bank of Ghana. (2022, October 6). Bank of Ghana Monetary Policy Committee. *108th Monetary Policy Committee*, *October*, 1–8.

Battese, G. E. (1992). Frontier production functions and technical efficiency: a survey of empirical applications in agricultural economics. *Agricultural Economics*, *7*(3–4), 185–208. https://doi.org/10.1016/0169-5150(92)90049-5

Battese, G. E., & Coelli, T. J. (1995). A model for technical inefficiency effects in a stochastic frontier production function for panel data. *Empirical Economics*, *20*(2), 325–332. https://doi.org/10.1007/BF01205442

Beghetto, R. A. (2018). *What If? Building Students' Problem-Solving Skills Through Complex Challenges*. ASCD.

Bekoe, E. L. (2021). *Information on imported livestock feed ingredients*. Accra, Ghana.

Belt, J., Kuleshov, A., & Minneboo, E. (2017). Development impact bonds: Learning from the Asháninka cocoa and coffee case in Peru. *Enterprise Development and Microfinance*, *28*(1–2), 130–144. https://doi.org/10.3362/1755-1986.16-00029

Bezabih, M., Abera, D., Adie, A., Lefore, N., & Jones, C. (2020). *Analysis of stakeholders roles and relationships in the feed value chain in Ethiopia* (No. 39; ILRI Discussion Paper).

Boakye, K. (2020). *Economic Analysis of Value Added Activities Along the Pineapple Value Chain in Selected Districts in the Central Region, Ghana* [University of Cape Coast]. https://erl.ucc.edu.gh/jspui

Bordens, K. S., & Abbott, B. B. (2014). *Research Design and Methods a Process Appr - Kenneth Bordens*.

Bosompem, M., Dadzie, S. K. N., & Tandoh, E. (2017). Undergraduate students' willingness to start own agribusiness venture after graduation: A Ghanaian case. *Contemporary Issues in Entrepreneurship Research*, *7*, 75–105. https://doi.org/10.1108/S2040-724620170000007009

Boswell, S. S. (2013). Undergraduates' Perceived Knowledge, Self-Efficacy, and Interest in Social Science Research. *The Journal of Effective Teaching*, *13*(2), 48–57. http://www.uncw.edu/jet/articles/vol132/boswell.pdf

Brazilian Poultry Association. (2012). Sustainability: Brazil's Poultry Industry's Competitive Advantage. *Brazilian Poultry Magazine*, 1–32.

http://www.brazilianchicken.com.br/files/publicacoes/a73f38b2e3b9c4140fea2045c0d0a52e.pdf

Brooks, K., Zorya, S., Gautam, A., & Goyal, A. (2013). *Agriculture as a Sector of Opportunity for Young People in Africa The World Bank Sustainable Development Network Agriculture and Environmental Services Department*. (June). Retrieved from http://econ.worldbank.

Byabashaija, W., & Katono, I. (2011). The impact of college entrepreneurial education on entrepreneurial attitudes and intention to start a business in Uganda. Journal of Developmental Entrepreneurship, 16(01), 127-144.

Byerlee, D., de Janvry, A., & Sadoulet, E. (2009). Agriculture for Development: Toward a New Paradigm. *Annual Review of Resource Economics*, *1*(1), 15–31. https://doi.org/10.1146/annurev.resource.050708.144239

Callegari, B., & Nybakk, E. (2022). Schumpeterian theory and research on forestry innovation and entrepreneurship: The state of the art, issues and an agenda. *Forest Policy and Economics*, *138*. https://doi.org/10.1016/j.forpol.2022.102720

Cameron, Adrian C., and Pravin K. Trivedi. (2010). Micro-econometrics Using Stata, rev. ed. College Station: Stata Press.

Carifio, J., & Perla, R. (2008). Resolving the 50-year debate around using and misusing Likert scales. *Medical Education*, *42*(12), 1150–1152. https://doi.org/10.1111/j.1365-2923.2008.03172.x

Carifio, J., & Perla, R. J. (2007). Ten Common Misunderstandings, Misconceptions, Persistent Myths and urban legends about Likert

scales and Likert response Formats and their Antidotes. *Journal of Social Sciences*, *3*(3), 106–116. https://doi.org/10.1016/0006-8993(93)90283-S

Carron, M., Alarcon, P., Karani, M., Muinde, P., Akoko, J., Onono, J., Fèvre, E. M., Häsler, B., & Rushton, J. (2017). The broiler meat system in Nairobi, Kenya: Using a value chain framework to understand animal and product flows, governance and sanitary risks. *Preventive Veterinary Medicine*, *147*(August), 90–99. https://doi.org/10.1016/j.prevetmed.2017.08.013

Cervantes-godoy, D., & Dewbre, J. (2010). *Economic Importance of Agriculture for Poverty Reduction* (No. 23; Issue 23). https://doi.org/10.1787/5kmmv9s20944-en

Chib, S., & Greenberg, E. (1998). Analysis of Multivariate Probit Models. *Biometrika*, *85*(2), 347–361. https://www.jstor.org/stable/2337362

Chibanda Musaba, E., & Chibalani, C. (2021). Determinants of Profit efficiency in smallholder broiler production in Kabwe district, Zambia. *Issue 1 Ser. III*, *14*(1), 6–14. https://doi.org/10.9790/2380-1401030614

Chibanda, C., Almadani, M. I., Thobe, P., & Wieck, C. (2022). Broiler production systems in Ghana: economics and the impact of frozen chicken imports. *International Food and Agribusiness Management Review*, 1–16. https://doi.org/10.22434/ifamr2021.0142

Christina, P.M., Matthew, G.K. and Eleni, A. (2013), "A multivariate probit model for analyzing travelers' choice of airline carrier", 7th International Congress on Transportation Research.

Ćompos, A. (2016, June). Brazil's Poultry Industry. *Monitor*, *2*(June), 3–18.

Conradie, B., & Piesse, J. (2016). Ranking perceived risk to farmers: How important is the environment? *African Journal of Agricultural and Resource Economics*, *11*(4), 1–16. https://afjare.org/media/articles/2.-Conradie-Piesse.pdf

Creswell, J. W. (2014). *Research Design* (4th Edition). SAGE Publications, Inc.

Creswell, J. W., Plano Clark, V. L., Gutmann, M. L., & Hanson, W. E. (2003). Advanced Mixed Methods Research Designs. In A. Tashakkori & C. Teddlie (Eds.), *Handbook of Mixed Methods in Social and Behavioral Research* (4th Editio, pp. 209–240). SAGE Publications, Inc.

Dadzie, S. K. N. (2016). *Decision behaviour under risk and climate change adaptation among food crop farmers in Ghana*. University of Reading.

Dadzie, S. K. N. (2019). Implications of Subjective Probabilities During Extreme Weather Events Associated with Climate Change (SPEWEACCS) for Climate Risk Assessment and Farm Adaptation Choices: A Study of Ghanaian Farmers. In O. H. . Awoye, R. N. Yegbemey, & S. E. H. Kokoye (Eds.), *Advancing Climate Change Research in West Africa: Trends, Impacts, Vulnerability, Resilience, Adaptation and Sustainability Issues* (Climate Ch, pp. 159–282). Nova Science Publishers, Inc.

Dadzie, S. K. N., Inkoom, E. W., Akaba, S., Annor-Frempong, F., & Afful, J. (2020). Sustainability responses to climate-smart adaptation in Africa: implication for food security among farm households in the Central Region of Ghana. *African Journal of Economic and Management Studies*, *12*(2), 208–227. https://doi.org/10.1108/AJEMS-04-2019-0155

Daum, T., & Birner, R. (2019). Agricultural mechanization in Africa: Myths, realities and an emerging research agenda. *Global Food Security*, *26*(November 2019), 100393. https://doi.org/10.1016/j.gfs.2020.100393

Debertin, L. D. (2012). *Agricultural Production Economics* (second). David L. Debertin.

den Broeder, C. (2018). *Utilizing Value Chain Analysis To Understand the Challenges of Tomato Farmers in Ghana: a Case Study of Matsekope* (Issue Unioninkatu 34) [University of Helsinki]. https://helda.helsinki.fi /handle/10138/229612

Department of Agriculture Forestry and Fisheries. (2013). Annual Report 2012/2013. In *Department of Agriculture, Forestry and Fisheries'* (Vol. 119, Issue 2). https://doi.org/10.1023/B:JOTA.0000005666.45436.37

Diao, X., Hazell, P., & Thurlow, J. (2010). The Role of Agriculture in African Development. *World Development*, *38*(10), 1375–1383. https://doi.org/10.1016/j.worlddev.2009.06.011

Díaz-Casero, J. C., Ferreira, J. J. M., Mogollón, R. H., & Raposo, M. L. B. (2012). Influence of institutional environment on entrepreneurial intention: a comparative study of two countries university students. *International Entrepreneurship and Management Journa*l, 8(1), 55-74.

Dlamini, B. P., Kirsten, J. F., & Masuku, M. B. (2014). Factors Affecting the Competitiveness of the Agribusiness Sector in Swaziland. *Journal of Agricultural Studies*, *2*(1), 61–72. https://doi.org/10.5296/jas.v2i1.4775

Douglas, E. J., & Shepherd, D. A. (1999). *Entrepreneurship as A Utility Maximizing Response*.

Douglas, E. J., & Shepherd, D. A. (2002). *Entrepreneurial Intentions, and Utility Maximization*.

Dziwornu, K. R. (2014). Econometric analysis of factors affecting competitive advantage of broiler agribusinesses in Ghana. *Journal of Development and Agricultural Economics*, *6*(2), 87–93. https://doi.org/10.5897/jdae2013.0527

Dziwornu, R. K., & Sarpong, D. B. (2014). Application of the Stochastic Profit Frontier Model To Estimate Economic Efficiency in Small-Scale Broiler Production in the Greater Accra Region of Ghana. *Review of Agricultural and Applied Economics*, *17*(02), 10–16. https://doi.org/10.15414/raae.2014.17.02.10-16

Eija, Y. P., Eila, J., & Pongsakdi, N. (2017). Primary School Student Teachers' Perceived and Actual Knowledge in Biology. *Center for Educational Policy Studies Journal*, *7*(4), 125–146. https://doi.org/10.26529/cepsj.367

Elsedig, E. A. A., Mohd, M. I., & Fatimah, M. A. (2015). Assessing the competitiveness and comparative advantage of broiler production in Johor using policy analysis matrix. *International Food Research Journal*, *22*(1), 116–121.

Etuah, S. (2014). *Cost Efficiency And Economies of Scale in Broiler Production in Ghana. A Case Study of The Ashanti Region* (Issue July). Kwame Nkrumah University of Science and Technology.

Etuah, S., Mensah, J. O., Aidoo, R., Musah, E. F., Botchwey, F., Oppong Adjei, L., & Owusu, K. (2021). Financial viability of processing broiler chicken into cut parts in Ashanti region of Ghana. *Cogent Food & Agriculture*, *7*(1), 1917742. https://doi.org/10.1080/23311932.2021.1917742

Etuah, S., Ohene-Yankyera, K., Liu, Z., Mensah, J. O., & Lan, J. (2020). Determinants of cost inefficiency in poultry production: evidence from small-scale broiler farms in the Ashanti Region of Ghana. *Tropical Animal Health and Production*, *52*(3), 1149–1159. https://doi.org/10.100 7/s11250-019-02115-6

Fanatico, A. (2003). *Small-Scale Poultry* (Issue May). Heifer International.

Farid, K. S., L. Mozumdar, M. S. Kabir, and U. K. Goswami. 2009. "Nature and Extent of Rural Women's Participation in Agricultural and Non-Agricultural Activities." Agricultural Science Digest 29 (4): 254–259.

Farole Thomas, Puerta Maria Laura Canut, A. S. and R. A. (2018). *Jobs in Value Chains Survey Tool Kit*. World Bank.

Farrell, M. . (1957). The Measurement of Productive Efficiency. *Journal of the Royal Statistical Society*, *120*(3), 253–290. https://www.jstor.org/stable/pdf/2343100.pdf?refreqid=excelsior%3A3e6bf6482e7b892a6a15d729995c42a3&ab_segments=&origin=&initiator=&acceptTC=1

Fonseca, P., & Picoto, W. N. (2020). The competencies needed for digital transformation. Online Journal of Applied Knowledge Management, 8(2), 53–70. https://doi.org/10.36965/ojakm.2020.8(2)53-70

Food and Agriculture Organization. (2015a). *Global trends in GDP and Agriculture Value Added*. *April*, 6.

http://www.fao.org/fileadmin/templates/ess/documents/GDP/IND_NewsRelease_EN__27Apr2015_.pdf

Food and Agriculture Organization. (2015b). Socio-economic context and role of agriculture Ghana. Country FaCt Sheet on Food and AgriCulture PoliCy Trends, (March), 6.

Fraenkel, J., & Wallen, N. (2000). How to design and evaluate research in education (4th ed.). New York, NY: McGraw-Hill, Inc.

Garcia-Winder, M., Riveros, H., Pavez, I., Rodriguez, D., Lam, F., Arias, J., & Herrera, D. (2009). Agrifood chains: a tool for strengthening the institutional framework of the agricultural and rural sector. *COMUNIICA, Fifth Year*, 26–37.http://repiica.iica.int/docs/B1617i/B1617i_1.html?gInitialPosX=alPosY=10px&gIniti 10px&gZoomValue=150

Gary, A. (2019). *Understanding the Complicated Role of Input Suppliers in Agricultural Extension and Advisory Services*. Agrilinks. https://agrilinks.org/post/input-supplier-roles-agricultural-extension-and-advisory-services

Gbedemah, S. F., Torgbor, F. O., & Kufogbe, S. K. (2018). Adaptation strategies of poultry farmers to rising temperature in the greater accra region of Ghana. *West African Journal of Applied Ecology*, *26*, 41–55.

Gbigbi, T. M., & Chuks-Okonta, V. A. A. (2020). Performance analysis of poultry feed marketers in Delta State, Nigeria. *International Journal Of Rural Development, Environment And Health Research*, *4*(4), 145–153. https://doi.org/10.22161/ijreh.4.4.3.

Gearhart, A., Booth, D. T., Sedivec, K., & Schauer, C. (2013). Use of Kendall's coefficient of concordance to assess agreement among observers of very high resolution imagery. *Geocarto International*, *28*(6), 517–526. https://doi.org/10.1080/10106049.2012.725775

Ghana Statistical Service. (2012). 2010 Population & Housing Census. In *Summary Report of Final Results*. Accra.

Ghana Statistical Service. (2016). 2015 Labour Force Survey. In *2015 Labour Force Survey Report* (Vol. 53, Issue 9). https://doi.org/10.1017/CBO9781107415324.004

Ghana Statistical Service. (2019a). 2017/18 Ghana Census of Agriculture. In *National Report*. Accra.

Ghana Statistical Service. (2019b). *Ghana Living Standards Survey round 7 (GLSS7)*. Retrieved from https://statsghana.gov.gh/gsspublications.php?category=MTAwMjg3Mzk3NC4zMDc=/webstats/1opr93rn57

Ghana Statistical Service. (2019c). *Rebased 2013-2018 Annual Gross Domestic Product*. Retrieved from https://statsghana.gov.gh/gssmain/storage/img/marqueeupdater/Annual_2013_2018_GDP_April 2019 Edition.pdf

Ghana Statistical Service. (2021). Ghana 2021 Population and Housing Census. In *PRELIMINARY REPORT* (Vol. 1, Issue 1).

Gimeno, J., Folta, T. B., Cooper, A. C., & Woo, C. Y. (1997). Survival of the Fittest ? Entrepreneurial Human Capital and the Persistence of Underperforming Firms Author (s): Javier Gimeno , Timothy B . Folta , Arnold C . Cooper and Carolyn Y . Woo Published by : Sage

Publications , Inc . on behalf of the Johnson. *Administrative Science Quarterly*, *42*(4), 750–783.

Goitom, G., Bezabih, E., & Berhanu, G. (2018). Profit Margin of Actors Along the Poultry Value Chain in Adwa Wereda , Central Zone of Tigray , Ethiopia. *Journal of Poverty, Investment and Development*, *41*, 56–64.

Góngora, R., Milán, M. J., & López-i-Gelats, F. (2019). Pathways of incorporation of young farmers into livestock farming. *Land Use Policy*, *85*(June), 183–194. https://doi.org/10.1016/j.landusepol.2019.03.052

González L., A. C., Rodríguez, Y. E., Gómez, J. M., Chávez, H., & Chea, J. (2021). Family business risk-taking and financial performance: Is it easier said than done? *Journal of Family Business Strategy*, *12*(4). https://doi.org/10.1016/j.jfbs.2021.100435

Goris, Y. (2016). *Youth inclusiveness in agricultural transformation, The case of Ghana*. (November).

Grimes, F., Kocevski, D., Dimitrievsk, D., Martinovska, A., Gjoshevski, D., Simonovska, A., Nacka, M., Stamenkovska, I. J., Pejkovsk, Z., Dzabirski, V., Srbinovska, S., Gjeorgjievski, S., Dodovski, A., Dimitrovski, V., & Buzharovska, D. (2019). *Sustainable broiler production in North Macedonia – A value chain guide to best practice*. FAO.

Gujarati, Damador. 2002. Basic Econometrics, 5th ed. New York: McGraw-Hill.

Gulati, A., Ganguly, K., & Wardhan, H. (2022). India Studies in Business and Economics Agricultural Value Chains in India. In *Chapter 7: Poultry Value Chain* (pp. 227–252). https://link.springer.com/bookseries/11234

Haggblade, S., Theriault, V., Staatz, J., Dembele, N., & Diallo, B. (2012). *A Conceptual Framework for Promoting Inclusive Agricultural Value Chains Improving the Inclusiveness of Agricultural Value Chains in West Africa*.

Hakemulder, R. and V. C. D. T. (2015). *Value Chain Development for Decent Work* (2nd ed.). International Labour Organization.

Hallak, R., Assaker, G. & O'Connor, P., 2012. Are Family and Nonfamily Tourism Businesses Different? An Examination of the Entrepreneurial Self-Efficacy-Entrepreneurial Performance Relationship. *Journal of Hospitality & Tourism Research*.

Hanson, W. E., Plano Clark, V. L., Petska, K. S., Creswell, J. W., & Creswell, J. D. (2005). Mixed methods research designs in counseling psychology. *Journal of Counseling Psychology*, *52*(2), 224–235. https://doi.org/10.1037/0022-0167.52.2.224

Hirwa, E. (2018). *an Economic Analysis of Poultry Production Efficiency and* [University of Nairobi]. http://erepository.uonbi.ac.ke/bitstream/handle/11295/104502/Hirwa _An Economic Analysis Of Poultry Production Efficiency And Marketing In Rwanda.pdf? sequence =1&isAllowed=y

Hopkins, T. K., & Wallerstein, I. (1977). Fernand Braudel Center, Research Foundation of State University of New York. *The Review: Fernand Braudel Center*, *39*(1), 83–128.

Inegbedion, G., & Islam, M. M. (2020). Youth motivations to study agriculture in tertiary institutions. *Journal of Agricultural Education and Extension*, *26*(5), 497–512. https://doi.org/10.1080/1389224X.2020.1773285

Jacques, H., Florian, P. and Alberto, H. (2009), "Estimation of multivariate probit models by exact maximum likelihood", Working Papers 0902, University of Lausanne, Institute of Health Economics and Management (IEMS).

Jamieson, S. (2004). Likert scales: how to (ab)use them. *Medical Education*, *38*(12), 1217–1218. https://doi.org/10.1111/j.1365-2929.2004.02012.x

Jeswani, H. K., Whiting, A., Martin, A., & Azapagic, A. (2019). Environmental impacts of poultry litter gasification for power generation. *Energy Procedia*, *161*, 32–37. https://doi.org/10.1016/j.egypro.2019.02.055

Jordá, P., Cascajo, R., & Monzón, A. (2012). Analysis of the Technical Efficiency of Urban Bus Services in Spain Based on SBM Models. *ISRN Civil Engineering*, *2012*(August), 1–13. https://doi.org/10.5402/2012/984758

Kadzamira, M. A. T. J., & Kazembe, C. (2015). This document is discoverable and free to researchers across the globe due to the work of AgEcon Search . Help ensure our sustainability . *Youth Engagement in Agricultural Policy Processes in Malaw*, *1*(3), 1–22. https://www.google.com/search?q=Youth+engagement+in+agricultural+policy+processes+in+Malaw&oq=Youth+engagement+in+agricultural+policy+processes+in+Malaw&aqs=chrome..69i57.1282j0j4&sourcei

d=chrome&ie=UTF-8

Kaplinsky, R., & Morris, M. (2001). A Handbook For Value Chain An Important Health Warning or A Guide for Using this Handbook. In *Institute for Development Studies: Brighton, UK* (Issue September). University of Sussex.

Kazeem, A. A., & Asimiran, S. (2016). Factors affecting entrepreneurial self-efficacy of engineering students. International Journal of Academic Research in Business and Social Sciences, 6(11), 519-534.

Kennedy, P Lynn, ;, Harrison, R. W., & Piedra, M. A. (1998). Analyzing Agribusiness competitiveness: The case of the United States Sugar Industry. *The International Food and Agribusiness Management Review*, *1*(2), 245–257.

Khaleda, S. (2013). The poultry value chain and sustainable development of poultry microenterprises that utilize homestead lands: A case study in Gazipur, Bangladesh. *Land Use Policy*, *30*(1), 642–651. https://doi.org/10.1016/j.landusepol.2012.05.010

Kidido, J. K., Bugri, J. T., & Kasanga, R. K. (2017). Dynamics of youth access to agricultural land under the customary tenure regime in the Techiman traditional area of Ghana. *Land Use Policy*, *60*, 254–266. https://doi.org/10.1016/j.landusepol.2016.10.040

Knight, F. H. (2019). Risk, Uncertainty, and Profit. In *Die 100 wichtigsten Werke der Ökonomie* (p. 388). The Riverside Press. https://doi.org/10.34156/9783791046006-108

Kodom, M., Azumah, S. B., Boateng, N. A., Tsekpo, E. M., Mensah, K. B., & Boateng, E. (2022). Changing the perceptions and attitudes of rural

Ghanaian youth towards cocoa farming. *Development in Practice*. https://doi.org/10.1080/09614524.2022.2086218

Kpentey, E. (2014). Enhancing the Production Capacity of Poultry Farmers. In *Business Advocacy News*. https://www.busac.org/downloads/monthly_news/03_October_2014_Newsletter-final.pdf

Krejcie, R. V, & Morgan, D. (1970). Determining Sample Size for Research Activities. *Educational and Psychological Measurement*, *30*(3), 607–610. Retrieved from https://doi-org.pva.uib.no/10.1177%2F001316447003000308

Krishnan, S., & Peterburns, T. (2017). *Jobs in Value Chains: Zambia* (Issue 6). http://documents.worldbank.org/curated/en/994421496902578364/pdf/115801-WP-7-6-2017-15-50-53-ZambiaVCWEB.pdf

Kwadzo, G., Dadzie, F., Osei-Asare, Y., & Kuwornu, J. K. M. (2013). Consumer Preference for Broiler Meat in Ghana: A Conjoint Analysis Approach. *International Journal of Marketing Studies*, *5*(2), 66–73. https://doi.org/10.5539/ijms.v5n2p66

Laughland-Booÿ, J., Mayall, M., & Skrbiš, Z. (2015). Whose choice? Young people, career choices and reflexivity re-examined. *Current Sociology*, *63*(4), 586–603. https://doi.org/10.1177/0011392114540671

Leavy, J., & Hossain, N. (2014). Who Wants to Farm? Youth Aspirations, Opportunities and Rising Food Prices. In *IDS Working Papers* (Vol. 2014). https://doi.org/10.1111/j.2040-0209.2014.00439.x

Legendre, P. (2005). Species associations: The Kendall coefficient of concordance revisited. *Journal of Agricultural, Biological, and Environmental Statistics*, *10*(2), 226–245. https://doi.org/10.1198/108571105X46642

Lin, J. Y. (2012). New structural economics: a framework for rethinking development and policy. *New Structural Economics*, Vol. 49, pp. 1–371. https://doi.org/10.5860/choice.49-7002

Loewenthal, K. M. (2004). Data and preliminary analysis. United Kingdom, UK: Psychology Press.

Mabe, F. N., Danso-Abbeam, G., Azumah, S. B., Boateng, N. A., Mensah, K. B., & Boateng, E. (2020). Drivers of youth in cocoa value chain activities in Ghana. *Journal of Agribusiness in Developing and emerging Economies*, *11*(4), 366-378.

Magagula, B., & Tsvakirai, C. Z. (2020). Youth perceptions of agriculture: influence of cognitive processes on participation in agripreneurship. *Development in Practice*, *30*(2). https://doi.org/10.1080/09614524.2019.1670138

Magnusson, D., & Törestad, B. (1993). A holistic view of personality: A model revisited. *Annual Review of Psychology*, *44*(1). https://doi.org/10.1146/annurev.ps.44.020193.002235

Mahadea, D. (2012). Prospects of entrepreneurship to the challenge of job creation in South Africa. *Journal of Developmental Entrepreneurship*, *17*(4), 1–18. https://doi.org/10.1142/S1084946712500203.

Mahama, E. A., Andah, E. K., Amegashie, D. P. K., & Mensah-Bonsu, A. (2013). Break Even Analysis of Broiler Production in the Accra-Tema and Kumasi Areas. *European Scientific Journal*, *9*(21), 24–26. http://www.eujournal.org/index.php/esj/article/view/1492

Mancinelli, A. C., Dal Bosco, A., Mattioli, S., Ranucci, D., & Castellini, C. (2018). Mobile poultry processing unit as a resource for small poultry farms: Planning and economic efficiency, animal welfare, meat quality and sanitary implications. *Animals*, *8*(12), 1–16. https://doi.org/10.3390/ani8120229

Marcinkiewicz, E. (2017). Pension systems similarity assessment: An application of Kendall's W to statistical multivariate analysis. *Contemporary Economics*, *11*(3), 303–314. https://doi.org/10.5709/ce.1897-9254.244

McLeod, A., Thieme, O., & MacK, S. D. (2009). Structural changes in the poultry sector: Will there be smallholder poultry development in 2030? *World's Poultry Science Journal*, *65*(2), 191–199. https://doi.org/10.1017/S0043933909000129

Meeussen, W., & Van Den Broeck, J. (1977). Efficiency Estimation from Cobb-Douglas Production Functions with Composed Error. *International Economic Review*, *18*(2), 435–444. https://www.jstor.org/stable/pdf/2525757.pdf

Menna, A., & Walsh, P. R. (2021). Assessing trajectories for innovation in farming from a profit theory perspective: The case of Ontario, Canada. *Outlook on Agriculture*, *50*(2), 158–168. https://doi.org/10.1177/0030727020937383

Mensah-Bonsu, A., & Rich, M. K. (2010). Ghana's Poultry Sector Value Chains and the Impacts of Highly Pathogenic Avian Influenza. *Department For International Development*, (October), 1–80.

Mensah-Bonsu, A., Lartey, N. N., & Kuwornu, J. K. M. (2019). Gender-segregated analysis of the poultry value chain in Ghana. *Gender, Technology and Development*, *23*(2), 130–164. https://doi.org/10.1080/09718524.2019.1661611

Metelerkamp, L., Drimie, S., & Biggs, R. (2019). We're ready, the system's not–youth perspectives on agricultural careers in South Africa. *Agrekon*, *58*(2), 154–179. https://doi.org/10.1080/03031853.2018.1564680

Middelberg, S. L. (2017). Value chain financing: Evidence from Zambia on smallholder access to finance for mechanization. *Enterprise Development and Microfinance*, *28*(1–2), 112–129. https://doi.org/10.3362/1755-1986.16-00027

Ministry of Employment and Labour Relations. (2014). *Ministry of Employment* (Vol. 1, pp. 1–51). Vol. 1, pp. 1–51. Accra: Ministry of Employment and Labour Relations.Accra, Ghana.

Ministry of Finance. (1999). The 1999 Budget Statement and Economic Policy. In *Archives of Dermatology* (pp. 1–98). Republic of Ghana. https://doi.org/10.1001/archderm.135.2.222

Ministry of Food and Agriculture (MOFA). (2017). *Planting for Food and Jobs (PFJ) FAQs*. 1–8. https://doi.org/10.1017/CBO9780511542268.002

Ministry of Food and Agriculture. (2019). *Medium Term Expenditure Framework (MTEF) for 2019-2022* (Issue August, p. 58). Republic of Ghana.

Ministry of Youth and Sports. (2010). *National Youth Policy of Ghana* (Vol. 1, pp. 1–33). Vol. 1, pp. 1–33. Retrieved from http://ir.parliament.gh/bitstream/handle/123456789/564/Ghana Youth Policy.pdf?sequence=1&isAllowed=y

Mitchell, J., Keane, J., & Coles, C. (2009). *Trading Up : How a Value Chain Approach Can Benefit the Rural Poor*. London.

Moffo, F., Mouliom Mouiche, M. M., Kochivi, F. L., Dongmo, J. B., Djomgang, H. K., Tombe, P., Mbah, C. K., Mapiefou, N. P., Mingoas, J. P. K., & Awah-Ndukum, J. (2020). Knowledge, attitudes, practices and risk perception of rural poultry farmers in Cameroon to antimicrobial use and resistance. *Preventive Veterinary Medicine*, *182*(February), 105087. https://doi.org/10.1016/ j.prevetmed.2020.105087

Mottet, A., & Tempio, G. (2017). Global poultry production: Current state and future outlook and challenges. *World's Poultry Science Journal*, *73*(2), 245–256. https://doi.org/10.1017/S0043933917000071

Mtemeri, J. (2017). *Factors Influencing the Choice of Career Pathways Among High School Students in Midlands Province, Zimbabwe* [University of South Africa]. https://ejournal. poltektegal.ac.id/index.php/siklus/article/view/298%0Ahttp://repositorio.unan.edu.ni/2986/1/5624.pdf%0Ahttp://dx.doi.org/10.1016/j.jana.2015.10.005%0Ahttp://www.biomedcentral.com/14712458/12/58%0Ahttp://ovidsp

.ovid.com/ovidweb.cgi?T=JS&P

Mulema, J., Mugambi, I., Kansiime, M., Chan, H. T., Chimalizeni, M., Pham, T. X., & Oduor, G. (2021). Barriers and opportunities for the youth engagement in agribusiness: empirical evidence from Zambia and Vietnam. *Development in Practice*, *31*(5), 690–706. https://doi.org/10.1080/09614524.2021.1911949

Mwaura, G., Allavi, E., Gawusu, K., & Amoateng, K. N. (2015). *Educated Youth in Agriculture : Awareness and Country-Level Initiatives in* (Issue May, pp. 1–10). pp. 1–10. Oxford.

Nääs, I. A., Neto, M. M., Waker, R., & Vendrametto, O. (2015). Brazilian Chicken Meat Production Chain : a 10-year Overview Brazilian Chicken Meat Production Chain : a 10-year Overview. *Revista Brasileira de Ciência Avícola*, *17*(1), 87–94. https://doi.org/10.1590/1516-635x170187-94

Nassirou Ba, M. (2017). Competiveness of Maize Value Chains for Smallholders in West Africa: Case of Benin, Ghana and Cote D'Ivoire. *Agricultural Sciences*, *08*(12), 1372–1401. https://doi.org/10.4236/as.2017.812099

National Chicken Council. (2021). *Vertical Integration*. https://www.nationalchickencouncil.org/industry-issues/vertical-integration/

Ncube, P. (2018). The southern African poultry value chain: Corporate strategies, investments and agro-industrial policies. *Development Southern Africa*, *35*(3), 369–387. https://doi.org/10.1080/0376835X.2018.1426446

Neuman, W. L. (2014). *Social Research Methods: Qualitative and Quantitative Approaches* (seventh). Pearson Education Lim ited.

Ng'atigwa, A. A., Hepelwa, A., Yami, M., & Manyong, V. (2020). Assessment of factors influencing youth involvement in horticulture agribusiness in Tanzania: A case study of Njombe region. *Agriculture (Switzerland)*, *10*(7), 1–17. https://doi.org/10.3390/AGRICULTURE10070287

Nganga, S. K., Kungu, J., de Ridder, N., & Herrero, M. (2010). Profit efficiency among Kenyan smallholders milk producers: A case study of Meru-South district, Kenya. *African Journal of Agricultural Research*, *5*(5), 332–337.

Nkukwana, T. T. (2018). Global poultry production: Current impact and future outlook on the South African poultry industry. *South African Journal of Animal Science*, *48*(5), 869–884. https://doi.org/10.4314/sajas.v48i5.7

Nmeregini, D. C., Onuekwusi, G. C., Ekweanya, N. M., & Elezue, C. S. (2020). Factors influencing involvement of youth in poultry production in Abia State, Nigeria. *Journal of Agricultural Extension*, *24*(4), 161–170. https://doi.org/10.4314/jae.v24i4.16

Norman, G. (2010). Likert scales, levels of measurement and the "laws" of statistics. *Advances in Health Science Education*, *15*, 625–632.

Nouala, S. ., Pica-Ciamarra, U. ., Otte, J., & N'guetta, A. (2011). *Investing in Livestock to Drive Economic Growth in Africa: Rationales and Priorities* (Issue April). https://doi.org/10.18356/ffdcb485-en

Nowiński, W., Haddoud, M. Y., Lančarič, D., Egerová, D., & Czeglédi, C. (2019). The impact of entrepreneurship education, entrepreneurial self-efficacy and gender on entrepreneurial intentions of university students

in the Visegrad countries. Studies in Higher Education, 44(2), 361-379.

Nti, F. K. (2018). *Economic analysis of Ghana's chicken industry*. Kansas State University.

Nwokoye, E. S., & Ilechukwu, N. (2018). Theory Of Costs. In *Principles of Economics 1* (Issue August, pp. 144–184). Department of Economics, Nnamdi Azikiwe University Awka Nigeria. https://www.researchgate.net/publication/326841533_Chapter_Five_Theory_Of_Costs

Nxumalo, K. K. S., and I. O. Oladele. 2013. "Factors Affecting Farmers' Participation in Agricultural Programme in Zululand District, Kwazulu Natal Province, South Africa." Journal of Social Science 34: 83–88.

O'Bryan, C. A., Crandall, P. G., Davis, M. L., Kostadini, G., Gibson, K. E., Alali, W. Q., Jaroni, D., Ricke, S. C., & Marcy, J. A. (2014). Mobile poultry processing units: A safe and cost-effective poultry processing option for the small-scale farmer in the United States. *World's Poultry Science Journal*, *70*(4), 787–802. https://doi.org/10.1017/S0043933914000853

Ofroi-atta, K. (2017). The Budget Statement of the Government of Ghana for the 2017 Financial Year. *The 2017 Budget Statement and Economic Policy*, p. 218. Accra: Ministry of Finance.

Ofori-Atta, K. (2018b). *The Budget Speech of the Government of Ghana for the 2019 Financial Year*. (November 2018). Retrieved from www.mofep.gov.gh

Okali, C., & Sumberg, J. (2012). Quick Money and Power: tomatoes and liveliohood building on Brong Ahafo, Ghana. *IDS Bulletin*, *43*(6), 44–57.

Oliveira, D. R. M. S., Nãās, I. A., Neto, M. M., Canuto, S. A., Walker, R., & Vendrametto, O. (2012). Issues of sustainability on the Brazilian broiler meat production chain. *Proceedings of the International Conference on Advances in Production Management Systems*. https://doi.org/10.1017/CBO9781107415324.004

Onumah, E. E., Naa Okailey, S., & Prince, A. O. (2021). *Value Chain Analysis of the Broiler Industry in The Southern Sector of Ghana*.

Organization International Labour. (2020). *Global Employment Trends for Youth 2020: Technology and the future of jobs*. Retrieved from https://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/---publ/documents/publication/wcms_737648.pdf

Ortiz, I., & Cummins, M. (2012). *When the Global Crisis and Youth Bulge Collide: Double the Jobs Trouble for Youth* (Issue February). https://www.unicef.org/socialpolicy/files/Global_Crisis_and_Youth_Bulge_-_FINAL.pdf

Osei-Asare, Y. B,, & Eghan, M. (2014). Meat Consumption in Ghana, Evidence from Household Micro-Data. *The Empirical Economics Letters*, *13*(2), 1681–8997.

Otoo, K. N., Osei-Boateng, C., & Asafu-Ajaye, P. (2009). The Labour Market in Ghana (2009/01; A Descriptive Analysis of the Labour Market Component of the Ghana Living Standards Survey (V)). https://ghanatuc.com/wp-content/uploads/2020/03/The-Labour-

Market-in-Ghana.pdf

Pallant, J. (2016). *SPSS survival manual: A step by step guide to data analysis using SPSS* (6th ed.). Open University Press.

Peffer, P. A. L., & Davis, M. E. (2018). Self-Estimates of Performance in Animal Sciences Courses and Factors that Influence Perceived Competence 1. *NACTA Journal*, *62*(2), 122–129.

Peng, Z., Lu, G., & Kang, H. (2012). Entrepreneurial Intentions and Its Influencing Factors : A Survey of the University Students in Xi ' an China. *Scientific Research*, *3*(December), 95–100. https://doi.org/10.4236/ce.2012.38b021

Piboonrungroj, P., Williams, S. J., & Simatupang, T. M. (2017). The emergence of value chain thinking. *International Journal of Value Chain Management*, *8*(1), 40. https://doi.org/10.1504/ijvcm.2017.10003558

Porter, M. E. (1985). *The Competitive Advantage: Creating and Sustaining Superior Performance*. Free Press.

Public Utilities Regulatory Commission. (2022, August 16). 2022-2025 Multi-Year Major Tariff Review for Natural Gas, Electricity and Water Services. *Press Release*, 1–4.

Pym, R. (2013). Poultry genetics and breeding in developing countries: Genetic diversity of genetic resources. In *Poultry development review* (pp. 1–3). FAO. fao.org/3/i3531e/i3531e.pdf

Radecki, C. M., & Jaccard, J. (1995). Perceptions of Knowledge, Actual Knowledge, and Information Search Behavior. *Journal of Experimental Social Psychology*, *31*(2), 107–138. https://doi.org/10.1006/JESP.1995.1006

Ragasa, C., Lambrecht, I., & Kufoalor, D. S. (2018). Limitations of Contract Farming as a Pro-poor Strategy : The Case of Maize Outgrower Schemes in Upper West Ghana. *World Development*, *102*, 30–56. https://doi.org/10.1016/j.worlddev.2017.09.008

Rahman, S. (2003). Profit efficiency among Bangladeshi rice farmers. *Food Policy*, *28*(5–6), 487–503. https://doi.org/10.1016/j.foodpol.2003.10.001

Raikes, B. P., Jensen, M. F., & Ponte, S. (2000). Global Commodity Chain Analysis and the French Filière Approach : Comparison and Critique. *Economy and Society*, *29*(October), 390–417. https://doi.org/10.1080/03085140050084589

Reji, M. E. (2013). Value Chains and Small Enterprise Development: Theory and Praxis. *American Journal of Industrial and Business Management*, *03*(01), 28–35. https://doi.org/10.4236/ajibm.2013.31004

Rich, K. M. (2011). *Poultry value chains and their linkages with HPAI risk factors : Synthesis of case study findings* (Issue May).

Rich, M. K., Baker, D., Negassa, A., & Ross, R. B. (2009). Concepts, applications, and extensions of value chain analysis to livestock systems in developing countries. *International Association of Agricultural Economists (IAAE) Conference, Beijing, China, August 16-22, 2009*, *1*. https://doi.org/10.22004/ag.econ.51922

Robinson, T., & Pozzi, F. (2011). Mapping supply and demand for animal-source foods to 2030. In *Animal Production and Health Working Paper. No. 2* (No.2). Rome: Food and Agriculture Organization.

Salvago, M. R., Phiboon, K., Faysse, N., Phuoc, T., & Nguyen, L. (2019). Young people ' s willingness to farm under present and improved conditions in Thailand. *Outlook on Agriculture*, *48*(4), 282–291. https://doi.org/10.1177/0030727019880189

Samboko, P. C., Zulu-Mbata, O., & Chapoto, A. (2018). Analysis of the animal feed to poultry value chain in Zambia. *Development Southern Africa*, *35*(3), 351–368. https://doi.org/10.1080/0376835X.2018.1480932

Schmidt, R. C. (1997). Managing Delphi surveys using nonparametric statistical techniques. Decision Sciences, 28(3), 763–774. https://doi.org/10.1111/j.1540-5915.1997.tb01330.x

Schumpeter, J. A. (2017). *The theory of economic development* (Issue December). Transaction Publishers.

Shayo, A. H., Rudd, R. D., Mattee, A., Price, T., Doolittle, P., & Friedel, C. (2020). *The Role Of Education System In Preparing Youth For Agricultural Career Decisions And Aspirations: Exploring Ways To Attract More Youth To Engage In Agriculture And Agricultural Entrepreneurship in Tanzania*. Virginia Polythenic Institute and State University.

Shinnar, R. S., Hsu, D. K., Powell, B. C., & Zhou, H. (2017). Entrepreneurial intentions and start-ups: Are women or men more likely to enact their intentions? International small business journal, 36(1), 60-80.

Simon, H. A. (1955). A Behavioral Model of Rational Choice. *The Quarterly Journal of Economics*, *69*(1), 99–118. https://www.suz.u zh.ch/dam/jcr:ffffffff-fad3-547b-ffff-fffff0bf4572/10.18-simon-55.pdf

South African Poultry Association. (2018). *South African Poultry Association 2018 Industry Profile*. http://www.sapoultry.co.za/pdf-docs/sapa-industry-profile.pdf

Sumberg, J, & Okali, C. (2013). Young People, Agriculture, and Transformation in Rural Africa: An "Opportunity Space" Approach. *Innovations: Technology, Governance, Globalization*, *8*(1–2), 259–269. https://doi.org/10.1162/inov_a_00178

Sumberg, J, Yeboah, T., Flynn, J., & Anyidoho, N. A. (2017). Young people's perspectives on farming in Ghana: a Q study. *Food Security*, *9*(1). https://doi.org/10.1007/s12571-016-0646-y

Sumberg, J., Anyidoho, N. A., Leavy, J., te Lintelo, D. J. H., & Wellard, K. (2012). Introduction: The Young People and Agriculture "Problem" in Africa. *IDS Bulletin*, *43*(6), 1–8. https://doi.org/10.1111/j.1759-5436.2012.00374.x

Sumberg, J., Awo, M., & Kwadzo, G. T. M. (2017). Poultry and policy in Ghana: Lessons from the periphery of an agricultural policy system. *Development Policy Review*, *35*(3). https://doi.org/10.1111/dpr.12223

Sumberg, J., Awo, M., & Fiankor, D. D. (2013). *Ghana Poultry: Limited Data, Conflicting Narratives, Competing Visions* (No. 56; STEPS Working Paper). https://steps-centre.org/publication/ghana-poultry/

Sumberg, J., Jatoe, J., Kleih, U., & Flynn, J. (2016). Ghana's evolving protein economy. *Food Security*, *8*(5), 909–920. https://doi.org/10.1007/S12571-016-0606-6/METRICS

Tahir, M. F., Abbas, M. A., Ghafoor, T., Dil, S., Shahid, M. A., Bullo, M. M. H., Ain, Q. ul, Abbas Ranjha, M., Khan, M. A., & Naseem, M. T. (2020). Seroprevalence and risk factors of avian influenza H9 virus

among poultry professionals in Rawalpindi, Pakistan. *Journal of Infection and Public Health*, *13*(3), 414–417. https://doi.org/10.1016/j.jiph.2020.02.030

Tantawy, A., Elkhashab, H., & El-Maddah, S. (2018). SWOT Analysis: A tool for making better business decisions. In *United States Department of Agriculture* (Vol. 7, Issue 3, pp. 327–340). United States Department of Agriculture. https://doi.org/10.21608/sinjas.2018.79051

Tarekegn, K., Kamaylo, K., Galtsa, D., Oyka, E., & Panchal, H. (2022). Youth Participation in Agricultural Enterprises as Rural Job Creation Work and Its Determinants in Southern Ethiopia. *Advances in Agriculture*, *2022*. https://doi.org/10.1155/2022/5760331

Teye, M., & Seidu, O. (2018). Constraints To Chicken Production And Marketing In Agona West District Of The Central Region, Ghana. *Ghanaian Journal of Animal Science*, *9*(1), 38–43. Retrieved from https://www.researchgate.net/publication/324835161

Tijani, A. A., Alimi, T., & Adesiyan, A. T. (2006). Profit Efficiency among Nigerian Poultry Egg Farmers : A Case Study of Aiyedoto Farm Settlement , Nigeria. *Research Journal of Agricultural Biological Sciences*, *2*(6), 256–261.

Tormala, Z. L., & Petty, R. E. (2007). *Contextual contrast and perceived knowledge : Exploring the implications for persuasion &. 43*, 17–30. https://doi.org/10.1016/j.jesp.2005.11.007

Tuffour, M., & Oppong, B. A. (2014). Profit Efficiency in Broiler Production: Evidence From Greater Accra Region of Ghana. *International Journal of Food and Agricultural Economics*, *2*(1), 23–32.

Tuffour, M., & Sedegah, D. (2013). What holds us back: constraints among broiler producers in Ghana. *Scientific Journal of Animal Science*, *2*(10), 264–272. https://doi.org/10.14196/sjas.v2i10.978

Tuyishimire, E., & Fudge, C. (2019). *Small scale poultry processing plant development in Musanze* (Issue August). University of Nebraska-Lincoln. https://doi.org/10.13140/RG.2.2.14189.54248

Udoye, C. E., Dimelu, M. U., Anugwa, I. Q., Ozioko, R. I., & Azubuike, F. C. (2019). Actors' Satisfaction with Poultry Value Chain Approach of the Commercial Agricultural Development Project in Enugu State, Nigeria. *Journal of Agricultural Extension*, *23*(4), 157–174. https://doi.org/10.4314/jae.v23i4.17

Umeh, N. G., Nwibo, S. U., Nwofoke, C., Igboji, C., Ezeh, A. N., & Mbam, N. B. (2020). Socio-economic determinants of agripreneurship choice among youths in Ebonyi State, Nigeria. *Journal of Agricultural Extension*, *24*(1), 24–33. https://doi.org/10.4314/jae.v24i1.3

Unveren, H. (2019). *Comprehensive Poultry Supply Chain Model with Vertical and Horizontal Linkages : Implication of Domestic and International Shocks*. University of Arkansas.

Valdes, C., Hallahan, C., & Harvey, D. (2015). Brazil's broiler industry: Increasing efficiency and trade. *International Food and Agribusiness Management Review*, *18*(SpecialIssueA), 263–275. https://doi.org/10.22004/ag.econ.207014

Van Horne, P. L. M. (2018). *Competitiveness of the EU poultry meat sector, base year 2017*.

van Horne, P. L. M., & Bondt, N. (2013). *Competitiveness of the EU poultry meat sector* (Issue Landbouw Economisch Instituut 068). www.wageningenUR.nl/en/lei%0A©

Vaske, J. 2008. Survey research and analysis: applications in parks, recreation and human dimensions. State College, Pennsylvania: Ventura Publishing.

Vermooij, A., Masaki, M. N., & Meijer-Willems, D. (2018). Regionalisation in poultry development in Eastern Africa. In *Wageningen Livestock Research* (Vol. 1, Issue 1121). www.wageningenUR.nl/livestoc kresearch%0Ahttps://knowledge4food.net/wp-content/uploads /2018/07/180724_nabc-wur_regional-poultry-study.pdf

Veterinary Services Directorate. (2021). Data on importation of poultry inputs. Accra, Ghana.

Waker, R., & Nääs, I. (2018). Structural attributes dynamics of the brazilian broiler production chain. *Revista Brasileira de Ciencia Avicola*, *20*(3), 517–526. https://doi.org/10.1590/1806-9061-2018-0799

Walton, T., & Grishin, V. (2018). Key Steps to Improve Agribusiness Competitiveness Part I : Input and Output Markets. In *EM Compass Note* (Vol. 49, pp. 1–7). www.ifc.org/thoughtleadership

Westhead, P., & Solesvik, M. Z. (2016). Entrepreneurship education and entrepreneurial intention: Do female students benefit? International small business journal, 34(8), 979-1003.

White, B. (2012). Agriculture and the Generation Problem. *IDS Bulletin*, *43*(6), 9–19. https://doi.org/10.3362/9781780447421

Williams, L. J., & Abdi, H. (2010). Fisher's Least Significant Difference Test. In *Encyclopedia of Research Design* (pp. 1–6). SAGE Publications Inc. https://doi.org/10.4135/9781412961288.n154

Wilson, F., Kickul, J., & Marlino, D. (2007). Gender, entrepreneurial self–efficacy, and entrepreneurial career intentions: Implications for entrepreneurship education. Entrepreneurship theory and practice, 31(3), 387-406.

Wilson, K. B. (2017). *Technical and operational audit of poultry processing plants*.

Wongnaa, C. A., Awunyo-Vitor, D., Mensah, A., & Adams, F. (2019). Profit efficiency among maize farmers and implications for poverty alleviation and food security in Ghana. *Scientific African*, *6*. https://doi.org/10.1016/j.sciaf.2019.e00206

World Bank. (2022). *Access to electricity (% of population) - Ghana*. https://data.worldbank.org/indicator/EG.ELC.ACCS.ZS?locations=GH

Wu, J.J. and Babcock, B.A. (1998), "The choice of tillage, rotation, and soil testing practices: economic and environmental implications", American *Journal of Agricultural Economics*, Vol. 80 No. 3, pp. 494-511.

Yevu, M., & Onumah, E. E. (2021). Profit efficiency of layer production in Ghana. *Sustainable Futures*, *3*, 100057. https://doi.org/10.1016/j.sftr.2021.100057

Yussuf, A. Y., AKhideno, L. ., Omoghie, E. ., Adetola, O. ., Osazuwa, D. ., & Simpson, V. . (2021). Determinant of Youth Participations in Agri-Business in Oluyole Local Government Area of Oyo State.

International Journal on Integrated Education, *4*(3), 1–11. https://doi.org/10.31149/IJIE.V4I3.1506

Ziegler, B., & Montplaisir, L. (2014). Student perceived and determined knowledge of biology concepts in an upper-level biology course. *CBE Life Sciences Education*, *13*(2), 322–330. https://doi.org/10.1187/cbe.13-09-0175

Zoller, C., & Bruynis, C. (2007). *Fact sheet* (p. 43351). Ohio State University Extension. http://ohioline.osu.edu

APPENDICES

Appendix A

Krejcie And Morgan (1970) Sample Determination Table

N	*S*	*N*	*S*	*N*	*S*
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	1000000	384

Note.—*N* is population size. *S* is sample size.

Source: Krejcie & Morgan, 1970

Appendix B

Structured Interview Schedule for Poultry Feed Millers/Manufacturers

UNIVERSITY OF CAPE COAST

SCHOOL OF AGRICULTURE

ANIMAL SCIENCE DEPARTMENT

Topic:

Performance, Challenges and Prospects along the Domestic Broiler Value Chain and Implications for Agricultural Graduate Employment in Ghana.

Introduction:

This questionnaire is aimed at assessing the current performance, challenges and opportunities along the local broiler value chain and the implications for job creation in Ghana

I would be grateful for your participation in this survey. The questions am going to ask concern broiler production and the broiler value chain activities in general; it would take about 30 minutes to go through these questions with you.

Participation voluntary:

Please also note that, participation in this survey is voluntary. For this reason you can choose not to answer any individual question or all of the questions. This notwithstanding, I look forward to your participation since your views are critical to this research.

Please, can I proceed to ask the questions? 1. Yes [ ] 2. No [ ]

Confidentiality Statement:

The data from you would be treated confidentially. Only the researcher, the supervisors and the enumerators will have access to the data. Your personal identity will be kept anonymous and be shielded from any other person or organization.

Contacts for Additional Information

If you have any question about the research please contact Mr. Bombason Kweku Tuoho- 0544294827 OR Prof. Julius Kofi Hagan- 0243253220.

Your rights as a Participant

This research has been reviewed and approved by the Institutional Review Board of University of Cape Coast (UCCIRB). If you have any questions about your rights as a research participant you can contact the Administrator at the IRB Office between the hours of 8:00 am and 4:30 p.m. through the phone lines 0558093143/0508878309 or email address: irb@ucc.edu.gh.

Name of region. …….. ***Name of District……***

Village/Town……

Date of interview ……....

Name of Respondent……

Telephone No ……..

Enumerator Name: _____

Section A: ***Demographic and Socio-Economic Characteristics of Poultry feed millers***

1. Sex of feed mill owner. **Please tick [√].** 1. Male [ ] 2. Female [ ]
2. Marital status. **Please tick [√].** 1. Single [ ] 2. Married [ ] 3. Divorced [ ] 4. Widowed [ ] 5. Co-habitation [ ]
3. Number of children …… Male……. Female ……

4. Number of children who are in school…….

5. Please indicate the number of dependents (household size) …….

6. Please indicate age of feed mill owner …… (In years)

7. Have you had any form of formal education? **Please tick [√].** ……. Yes [ ] No [ ]

8. If yes, what is your highest level of education? **Please tick [√].** 1. Basic Education [ ]

2. Secondary/Technical or Vocational [ ] 3. Tertiary [ ]

10. How long has your firm or company been involved in poultry feed milling/ manufacturing? ……. (In years).

11. Please are you milling the feed for a fee (toll) or you are milling the feed to sell (manufacturing-commercial)? ..... **Please tick [√].** 1. Milling to for a fee (toll) [ ] 2. Milling to sell [ ]

3. Both (1& 2) [ ] 4. Other (specify) …….

12. If milling the feed for a fee (toll), on average how many metric tonnes (MT) are you able to mill per day _____ per week _____ per month _____

13. Please how much do you charge per each MT of feed you mill? _____

14. Kindly indicate if you are into other lines of business related to livestock apart from feed milling/manufacturing? **Please tick [√].** 1. Yes [ ] 2. No [ ]

15. If yes, please indicate the other lines of business your company is involved in ……..

16. Please what type of feed do you mill/manufacture? **Please tick [√].** 1. Layer mash [ ],

2. Grower mash [ ], 3. Chick mash [ ], 4. Broiler starter [ ] 5. Broiler finisher [ ] 6. Other (specify)……..

17. Do you belong to a feed miller's group/cooperative/association? **Please tick [√].** 1. Yes [ ] 2. No [ ]

18. If a member of a feed millers association/cooperative/ group? Do your membership help you in your feed milling business? **Please tick [√].** 1. Yes [ ] 2. No [ ]

19. If yes, in what ways? ……

20. Have you had any form of training from the association (e.g. training on food safety, nutrition or business management, etc.,) in the past three years? **Please tick [√].**1. Yes [ ] 2.No [ ]

21. If yes, what type of training ……..

22. Please indicate the type of ownership of the site (building) of your operations. **Please tick [√].** Sole owned site [ ] 2. Family owned site [ ] 3. Rented site [ ]

4. District Assembly owned site [ ] 5. Other (Please specify) ……

23. How many poultry feed mills do you have?

24. What is the total operational (potential) capacity of all your feed mills combined? Mt

25. Please what is the current (actual) production capacity of all your feed mills combined? ……Mt

26. Which of the following best describes your typical production cycle. **Please tick [√].**

1. Daily [ ] 2. Weekly [ ] 3. Monthly [ ] 4. Others (specify_____

27. What is the total production per production cycle (tonnage)? .....

28. How many workers do you have? Total..... Males___ Females____ workers under 36 years_____

29. What are the sources of your ingredients (maize, wheat brand, fishmeal, etc.)?..... **Please tick [√].** 1. Sourced locally within Ghana [ ]

2. Imported into Ghana [ ] 3. Both 1& 2 [ ] 4. Others (specify).....

30. How easy or difficult is it to get feed ingredients/raw materials for your operations? **Please tick**

[√]. 1. Extremely difficult [ ] 2. Very difficult [ ] 3. Difficult [ ] 4. Not difficult [ ]

5. Very easy [ ] 6. Other (specify) ……

31. Which of the following expertise/experts do you have? **Please tick [√].** 1. Nutritionist, [ ] 2.

Biochemist [ ], 3. Quality control officer [ ] 4. Other (specify).....

321. How often do you test feed milled/manufactured by your outfit? .....

33. Please, have you ever accessed cash credit? **Please tick [√].** 1. Yes [ ]

2. No [ ]

34. If yes, when was the last time you had access to cash credit? 1.2021 [ ] 2. 2020 [ ] 3. 2019 or before [ ]

35. What was the source of the cash credit? **Please tick [√].** 1. Banks/Savings and Loans/Microfinance [ ] 2. Relatives [ ] 3. Colleague feed miller/friends [ ] 4. NGOs [ ] 5. Agro-input dealers [ ] 6. Poultry out-grower [ ] 7. Poultry processing/buying companies [ ]

36. Have you insured your business operations (feed milling) with an insurance company?

Please tick [√]. 1. Yes [ ] 2.No [ ]

37. If yes, which aspects of the business is ensured? **Please tick [√].** 1. Building and equipment's [ ] 2. Feed milling [ ] 3. Staff [ ] 4. All [ ]

38. If no, why?

Section B: Institutional and Regulatory Issues

1. Are you aware of any law/regulation governing the setting up of feed mills in the country?

   Please tick [√]. 1. Yes [ ] 2. No [ ]

2. Do you require a permit or approval for your operations from any government agency or professional associations? **Please tick [√].** 1. Yes [ ] 2. No [ ]

3. Kindly indicate if your business is regulated by any of the following government agencies or professional associations. **Please tick [√] all that apply.**

   1. Environmental Protection agency [ ]
   2. Food and drugs authority [ ]
   3. Ghana standard authority [ ]

4. Veterinary services directorate [ ]

5. Animal production directorate [ ]

6. Feed millers/manufacturers association of Ghana [ ]

7. District Assembly [ ]

8. Environmental Health Department [ ]

4. If you got approval or permit from any government agency or professional associations before starting your operations, kindly rate your experience?

Item	**Please tick [√]**
Service delivery	
Poor	
Good	
Very Good	
Excellent	
Cost of services	
Low	
Moderate	
High	
Very high	

Section C: Cost of Production, Output and Sales feed

1. Please what is your typical Broiler Starter Feed production cycle?
2. Kindly complete the table below on the fixed inputs used per a typical Broiler Starter Feed production cycle

Fixed inputs	**Quantity**	**Unit cost (GH¢)**	**Total cost (GH¢)**
Land (site of operation)			
Feed milling machine			
Stand by generator			
Warehouse			
Other (Please specify)			

3. Kindly complete the table below on the variable inputs costs per a typical Broiler Starter Feed production cycle

Variable inputs	Quantity	Unit cost (GH¢)	Total cost (GH¢)
Labour (workers' wages & salaries)			
Raw materials (e.g. maize, soya bean, Premix, Concentrate & toxin binders)			
Electricity			
Maintenance/repairs			
Water			
Transportation			
Packaging of feed			
Other (specify……)			

4. **Please tick [√] tick all** the ingredients listed in the table below that are used for Broiler Starter Feed production for a typical production cycle

Ingredient	Ingredient Used	Quantity Used (Kg)
White maize		
Yellow maize		
Wheat bran		
Soybeans		
Oyster shell		
Fish meal		
Copra cake		
Palm kernel cake		
Cottonseed cake		
Salt		
Toxin Binder		
Layer Premix		
Hendrix		
Diacalcium		
Microchem		
Lysine		
Methionine		
Mycofix		
Enzyme		

5. Please what is your typical Broiler Grower Feed production cycle?

6. Kindly complete the table below on the fixed inputs used per a typical Broiler Grower Feed production cycle

Fixed inputs	**Quantity**	**Unit cost (GH¢)**	**Total cost (GH¢)**
Land (site of operation)			
Feed milling machine			
Stand by generator			
Warehouse			
Other (Please specify)			

7. Kindly complete the table below on the variable inputs costs per a typical Broiler Grower Feed production cycle

Variable inputs	**Quantity**	**Unit cost (GH¢)**	**Total cost (GH¢)**
Labour (workers' wages & salaries)			
Raw materials (e.g. maize, soya bean, Premix, Concentrate & toxin binders)			
Electricity			
Maintenance/repairs			
Water			
Transportation			
Packaging of feed			
Other (specify……)			

8. Please what is your typical Broiler Finisher Feed production cycle?

9. Kindly complete the table below on the fixed inputs used per a typical Broiler Finisher Feed production cycle

Fixed inputs	**Quantity**	**Unit cost (GH¢)**	**Total cost (GH¢)**
Land (site of operation)			
Feed milling machine			
Stand by generator			
Warehouse			
Other (Please specify)			

10. Kindly complete the table below on the variable inputs costs per a typical Broiler Finisher Feed production cycle

Variable inputs	Quantity	Unit cost (GH¢)	Total cost (GH¢)
Labour (workers' wages & salaries)			
Raw materials (e.g. maize, soya bean, Premix, Concentrate & toxin binders)			
Electricity			
Maintenance/repairs			
Water			
Transportation			
Packaging of feed			
Other (specify……)			

11. Feed production quantities and Sales information for a typical production cycle

Type of feed	Quantity of feed produced per cycle(in 50kg bags)	Unit Price (GH¢/50kg bag)	Total Revenue from sales (GHC)
Broiler starter marsh			
Broiler grower			
Broiler finisher			
Layer starter			
Layer grower			
Layer /finisher			

Section D: marketing of feed

1. Please what type of feed do you produce? **Please tick [√].** 1. Layer mash [ ], 2. Grower mash [ ], 3. Chick mash [ ], 4. Broiler starter [ ] 5. Broiler finisher [ ]

2. Please indicate the volume/quantity of sales below

Period	**Volume/Quantity (mt/bags)**
Weekly	
Monthly	
Yearly	

3. Please indicate who you sell your feed to and the proportions of sale

	Buyer	Proportion (in percentage)
1.0	Directly to poultry farmers	
2.0	Retailers	
3.0	Wholesalers	
4.0	Others (specify)……	

4. What proportion of your feed do you sell at the feed mill_____; through Agents_____; others_____

5. Please indicate the number of trucks _____; and the number of driver's _____; you engage to carry your feed ingredients from suppliers and the feed you produce to buyers?

Number of trucks	Number of drivers (including driver metes)
Carrying of feed ingredients from suppliers	
Carrying of feed produced to buyers and distribution centers	

6. Do you have contractual agreement with any person or business to supply your feed to?

   Please tick [√]. 1. Yes [ ] 2. No [ ]

7. If yes, what type of agreement is it? **Please tick [√].** 1. Verbal/word of mouth [ ]

   2. Written agreement [ ] 3. Others (specify)…….

8. Do you think there is ready market for the product (poultry feed)? **Please tick [√].** 1. Yes [ ] 2. No [ ]

9. If no, why?

10. If yes, explain …….
11. Do you consider access to market before producing the poultry feed? **Please tick [√].** 1. Yes [ ] 2. No [ ]
12. Who sets the markets price? **Please tick [√].** 1. Regulated price by third party [ ] 2. Market forces [ ] 3. Self [ ] 4. Other actors [ ]
13. How would you rate the unit price at which you sold your produce? **Please tick [√].** 1. Higher than your expected [ ] 2. Lower than your expected [ ] 3. Meet your expectation [ ] 4. Moderate [ ]
14. Which of the following drive the demand for your feed milling or the feed you produced? **Please tick [√].** 1. Quality [ ] 2. Quality [ ] 3. Both quality and quantity 4. Others (specify…….
15. How do customers/clients pay for the feed they buy? **Please tick [√].** 1. Cash on delivery [ ] 2. Mobile Money 3.Credit [ ] 4. Contract [ ] 5. Other (specify)……..

Section E: Production and Marketing Constraints of feed milling/processing

1. Indicate the extent to which you agree or disagree with the existence of the following constraints affecting feed milling/processing? (Enumerator please note; circle only one answer in each row)

Production Constraints of feed milling/processing

Constraints	Strongly Agree	**Agree**	**Some what agree**	**Disagree**	**Strongly Disagree**
Limited access to credit facilities	1	2	3	4	5
High interest rates on loans	1	2	3	4	5
In adequate training for feed millers	1	2	3	4	5
Limited capacity to meet Government regulations (EPA, FDA & VSD)	1	2	3	4	5
Limited production capacity	1	2	3	4	5
Low level of research and knowledge transfer	1	2	3	4	5
High Energy costs (fuel and electricity)	1	2	3	4	5
Environmental regulation	1	2	3	4	5
Limited access to key ingredients for feed formulation (e.g. Low volumes of yellow maize when needed)	1	2	3	4	5
Limited Access to laboratories for testing ingredients	1	2	3	4	5
High Labour costs	1	2	3	4	5
Price volatility of maize and soybean	1	2	3	4	5
High Transportation costs	1	2	3	4	5
Price volatility of other Inputs apart from maize and soybean	1	2	3	4	5

a. Marketing Constraints of feed milling/processing

Constraints	Strongly Agree	**Agree**	**Somewhat agree**	**Disagree**	**Strongly Disagree**
Limited access to current market information	1	2	3	4	5
Pricing difficulties	1	2	3	5	5
Lack of specialized vehicles to transport feed	1	2	3	4	5
Lack of specialized warehouses for feed storage	1	2	3	4	5
low demand for feed by poultry farms	1	2	3	4	5
Inaccessible distribution of shops due to distance	1	2	3	4	5
Inaccessibility of feed mills due to distance	1	2	3	4	5
Stiff competition from imported poultry feed	1	2	3	4	5
Failure of farmers to repay supplies given them on credit	1	2	3	4	5
Farmers are always not ready to pay the right fees (toll) for processing their feed	1	2	3	4	5

Appendix C

Structured Interview Schedule for Broiler Farmers
UNIVERSITY OF CAPE COAST

SCHOOL OF AGRICULTURE

ANIMAL SCIENCE DEPARTMENT

Topic:

Performance, Challenges and Prospects along the Domestic Broiler Value Chain and Implications for Agricultural Graduate Employment in Ghana.

Introduction:

This questionnaire is aimed at assessing the current performance, challenges and opportunities along the local broiler value chain and the implications for job creation in Ghana

I would be grateful for your participation in this survey. The questions am going to ask concern broiler production and the broiler value chain activities in general; it would take about 30 minutes to go through these questions with you.

Participation voluntary:

Please also note that, participation in this survey is voluntary. For this reason you can choose not to answer any individual question or all of the questions. This notwithstanding, I look forward to your participation since your views are critical to this research.

Please, can I proceed to ask the questions? 1. Yes [ ] 2. No [ ]

Confidentiality Statement:

The data from you would be treated confidentially. Only the researcher, the supervisors and the enumerators will have access to the data. Your personal identity will be kept anonymous and be shielded from any other person or organization.

Contacts for Additional Information

If you have any question about the research please contact Mr. Bombason Kweku Tuoho- 0544294827 OR Prof. Julius Kofi Hagan- 0243253220.

Your rights as a Participant

This research has been reviewed and approved by the Institutional Review Board of University of Cape Coast (UCCIRB). If you have any questions about your rights as a research participant you can contact the Administrator at the IRB Office between the hours of 8:00 am and 4:30 p.m. through the phone lines 0558093143/0508878309 or email address: irb@ucc.edu.gh.

Name of region……. ***Name of District.*** ***……***

Village/Town……

Date of interview ……....

Name of Respondent……

Telephone No ……

Enumerator Name: _____

Section A: ***Demographic and Socio-Economic Characteristics of Poultry farmers/producers***

4. Sex of farm owner. **Please tick [√].** 1. Male [ ] 2. Female [ ]

2. Marital status. **Please tick [√].** 1. Single [ ] 2. Married [ ] 3. Divorced [ ] 4. Widowed [ ] 5. Co-habitation [ ]

3. Number of children …… Male…….. Female ……...

4. Number of children who are in school…….

5. Please indicate the number of dependents (household size) …….

6. Please indicate age of farm owner …… (In years)

8. Have you had any form of formal education? **Please tick [√].** 1. Yes [ ] 2. No [ ]

9. If yes, what is your highest level of education? **Please tick [√].** 1. Basic Education [ ] 2. Secondary/Technical or Vocational [ ] 3. Tertiary [ ]

10. When was your poultry farm established? .....

11. How long has your poultry farm been producing birds? 1. Broilers …….. 2. Layers …..

12. Do you have an occupation other than poultry farming? **Please tick [√].** 1. I don't have any other occupation [ ] 2. Public or Civil Servant [ ] 3. Private sector employee [ ] 4. Other (Please specify) ……

13. Do you belong to any poultry cooperative/association? **Please tick [√].** 1. Yes [ ] 2. No [ ]

14. If a member of a poultry farmer's association/cooperative/ group? Do your membership helped you in your poultry production business? **Please tick [√].** 1. Yes [ ] 2. No [ ]

15. If yes, in what ways? ……

16. Have you receive any form of training from the association? (E.g. training on poultry production, farm safety, nutrition or business management, etc.,) in the past three years? **Please tick [√].**

1. Yes [ ] 2.No [ ]

17. If yes, what type of training ……..

18. How many poultry farms do you have?

19. What type of production phase are you practicing in your farm? **Please tick (√).** 1. Starter phase [ ] 2. Finisher phase [ ] 3. Starter to finisher phase [ ]

20. At what age do you sell your birds……..?

21. What is the total bird capacity (potential) of your farm per production cycle?

22. What was the population of broilers for the last production cycle?.....

23. Please, for the broilers, how many batches do you do in a year?.....

24. Please which of the following describes the type of labour you are using on the farm. **Please tick [√] all that applies.** 1. Family labour [ ] 2. Temporal hired labour [ ] 3. Permanent hired labour [ ] 4. Family labour and Temporal hired labour [ ] 5. Family labour and Permanent hired labour [ ] 6. Other (specify)……

25. How many workers do you have? Total..... Males___ Females____ workers under 36 years_____

26. How many are working in the broiler section?.....

27. Do you have access to extension services (veterinary, animal husbandry, nutrition)? **Please tick [√].** 1. Yes [ ] 2. No [ ]

28. Please, have you ever access credit? **Please tick [√].** 1. Yes [ ] 2.No [ ]

29. If yes, when was the last time you had access to credit? **Please tick [√].**

1. 2021 [ ] 2. 2020 [ ] 3.2019 or before [ ]

30. What was the means of repayment? **Please tick [√].** 1. Cash [ ] 2.In-kind [ ]

31. What was the source of the credit? **Please tick [√].** 1. Banks/Savings and Loans/Microfinance/Credit union [ ] 2. Relatives [ ] 3. Colleague's poultry Farmers/friends [ ] 4. NGOs [ ] 5. Agro-input dealers [ ] 6. Poultry out-grower [ ] 7. Poultry processing/buying companies [ ]

32. Have you insured your business operations (poultry farm) with an insurance company?

Please tick [√]. 1. Yes [ ] 2. No [ ]

33. If yes, which aspects of the business is ensured? **Please tick [√].** 1. Building and equipment's [ ] 2. Birds (broilers) [ ] 3. Staff [ ] 4. All [ ]

34. If no, why?.....

35. Please indicate your source of supply for the under listed inputs

	Input	**Source of supply** –Please tick [√]	
1	Feed	Own formulation	
		local feed mills	
		Imported feed	
		Others (specify)….	
2	DOCs	Local hatcheries	
		Imported DOCs	
		Own hatchery	
		Others (specify)….	
3	Vaccines & Medications	Government Veterinary service	
		Private veterinary service	
		NGOs providing veterinary services	
		Others (specify)	
4	Equipment's	Importers of poultry production equipment	
		Local producers/fabricators of poultry production equipment	
		Used equipment (equipment have been used in Ghana by a farm before)	
		Others (specify)	
5	Others (specify)		

Section B: Institutional and Regulatory Issues

1. Are you aware of any law/regulation governing the setting of up of a broiler (poultry) farm in the country? **Please tick [√]** 1.Yes [ ]
   2. No [ ]
2. Do you have a permit or approval for your broiler (poultry) farm operations from any government agency or professional associations? **Please tick [√]** 1. Yes [ ] 2. No [ ]
3. Kindly indicate if your broiler (poultry) farm business is regulated by any of the following government agencies or professional associations. **Please tick [√]** all that apply.
   1. Environmental Protection agency [ ]
   2. Food and drugs authority [ ]
   3. Ghana standard authority [ ]
   4. Veterinary services directorate [ ]
   5. Animal production directorate [ ]
   6. Ghana National Association of Poultry Farmers [ ]
   7. District Assembly [ ]
   8. Environmental Health Department

4. If, you got approval or permit from any government agency or professional association before starting your operations, kindly rate your experience?

Item	**Please tick [√]**
Service delivery	
Poor	
Good	
Very Good	
Excellent	
Cost of services	
Low	
Moderate	
High	
Very high	

Section C: Cost of Production, Output and Sales of last year's broilers

1. Fixed inputs used for a typical production cycle

Fixed inputs	**Quantity**	**Unit cost GH¢**	**Total cost GH¢**
Land (site of operation)			
Poultry house (Sheds/Pens-rented or constructed)			
Feeders			
Brooder facility (s)			
Waterers/ Drinkers			
Vehicle			
Buckets			
Shovels			
Water Reservoirs			
Wheelbarrow(s)			
Push truck(s)			
Other (Please specify)			

2. Variable inputs used

2.1 Day-old-chicks (DOCs)

Total number of Day-old-chicks (DOCs)	Date Received	Mortality	Unit Price GH¢	Total cost GH¢

2.2 Labour

Number of workers	Labour cost per day	Labour cost per month	Labour cost per production cycle	Total cost of labour GH¢

2.3 Feed, Medications & Others

Ingredient	Unit	Quantity Used	Unit Cost (GH¢)	Total Cost (GH¢)
FEED				
Broiler Starter	bags			
Broiler Grower	bags			
Broiler Finisher	bags			
Other feeds(specify)	bags			
FEED SUPPLEMENTS				
Vitamins	Kg			
Minerals	Kg			
Others (specify)	Kg			
VACCINES/DRUGS/CHEMICALS				
Newcastle vaccination	doses			
Gumboro Vaccination	doses			
Coccidiostats	Kg			
Other vaccinations (specify)	doses			
Endo-parasites (worms) Control Drugs(if any)	doses			
Ecto-parasite (Mite, Lice) Control Drugs (if any)	doses			
Antibiotics	Mg			
Disinfectants	Mg			
MISCELLANEOUS ITEMS /SERVICES				
Water	Liter			
Lightening/ Electricity	KWh			
Transportation of goods				
Litter	Kg			
Milling of maize				
Credit Cost/ Source				
Maintenance/repairs				
Charcoal				
Others (Specify)..……..				

2.5 Sales or marketing information

Number of birds raised for sale during the last production cycle	Average mortality	Number of birds sold	Average price per bird GH¢	Total sales value GH¢

Section D: Channels of marketing broiler

1. In what form do you sell the broilers? **Please tick (√) all that applies**

1. Live birds [ ] 2. Whole dressed [ ] 3. Chicken-cuts/parts [ ]

4. Other (specify)…….

2. Please indicate who you sell your live birds or dressed chicken to?

	Product	Buyer	Please tick (√) all that applies
1.	Live bird	Direct-to-consumer	
		Retailers	
		Whole-sealers	
		Hotels	
		Restaurants	
		Institutions	
		Chop-bars	
		Processors	
		Hawkers	
		Others(specify)	
2.	dressed chicken	Direct-to-consumer	
		Retailers	
		Whole-sealers	
		Hotels	
		Restaurants	
		Institutions	
		Chop-bars	
		Processors	
		Hawkers	
		Others (specify)	
3.	Others(specify)		

3. Where do you sell your broilers? **Please tick [√].** 1. Farm gate [ ] 2. Village market [ ] 3. Town market [ ] 4. Road side [ ] 5. Live bird market [ ] 6. Others (specify)……
4. Do you have an agreement with any person or business to supply your broiler to? **Please tick [√].** 1. Yes [ ] 2. No [ ]
5. If yes, what type of agreement is it? **Please tick [√]** 1.Verbal/word of mouth [ ] 2. Written agreement [ ] 3.Others (specify)…….
6. Have you ever been contracted to produce broilers? **Please tick [√].**

   1. Yes [ ] 2. No [ ]
7. If yes, by whom? **Please tick [√]** 1. Processor [ ] 2. Marketer [ ] 3. An out grower [ ] 4. An input supplier [ ] 5. Others (specify) ……
8. Do you think there is ready market for the broilers you produced? **Please tick [√]** 1. Yes [ ] 2. No [ ]
9. If no why?.....
10. If yes, explain …….
11. Do you consider access to market before producing the broilers? **Please tick [√]** 1. Yes [ ] 2. No [ ]
12. Who sets the markets price? **Please tick [√]** 1. Regulated price by third party [ ] 2. Market forces [ ] 3. Self [ ] 4. Other actors [ ]
13. How would you rate the unit price at which you sold your broilers? **Please tick [√]** 1. Higher than you expected [ ] 2. Lower than you expected [ ] 3. Meet your expectation [ ] 4. Moderate [ ]

14. Which of the following drive the demand for your broilers? **Please tick [√]** 1. Quality [ ] 2. Quantity [ ] 3. Both quality and quantity 4. Others (specify…….

15. How do customers/clients pay for the broilers they buy? **Please tick all that apply [√]** 1. Cash on delivery [ ] 2. Mobile Money on delivery 3.Credit [ ] 4. Contract [ ] 5. Other (specify)……..

Section E: Production and Marketing Constraints of domestic broiler

1. Indicate the extent to which you agree or disagree with the existence of the following constraints affecting local broiler production. **(Enumerator please note; circle only one answer in each row)**

a. Production Constraints of domestic broiler

Constraints	**Strongly Agree**	**Agree**	**Somewhat agree**	**Disagree**	**Strongly Disagree**
Lack of credit facilities	1	2	3	4	5
High cost of credit	1	2	3	4	5
Lack of insurance policy	1	2	3	4	5
Diseases outbreaks	1	2	3	4	5
Lack of access to improved broiler breeds	1	2	3	4	5
Lack of access to extension services (veterinary and animal husbandry services)	1	2	3	4	5
Government regulations (EPA, FDA & VSD)	1	2	3	4	5
High level of importation of poultry production inputs	1	2	3	4	5
Low level of research and knowledge transfer	1	2	3	4	5
High cost of vaccines and drugs	1	2	3	4	5
High feed cost	1	2	3	4	5
Lack of Government subsidy	1	2	3	4	5
High cost of day old chicks	1	2	3	4	5
High labour cost	1	2	3	4	5
Lack of quality day old chicks from most local hatcheries	1	2	3	4	5
Inadequate capacity building programs for farmers	1	2	3	4	5
High energy cost (fuel and electricity)	1	2	3	4	5

b. Marketing Constraints of domestic broiler

Constraints	Strongly Agree	Agree	Somewhat agree	Disagree	Strongly Disagree
Time spent to dress the bird	1	2	3	4	5
Lack of access to current market information	1	2	3	4	5
Level of education of consumers	1	2	3	4	5
Level of health awareness or consciousness of consumer	1	2	3	4	5
Income levels of consumers	1	2	3	4	5
Distance to market where birds are sold	1	2	3	4	5
Customers taste and preferences	1	2	3	4	5
Competition from cheap poultry meat import	1	2	3	4	5
Marital status of consumers	1	2	3	4	5

Appendix D

Structured Interview Schedule for Poultry Processors

UNIVERSITY OF CAPE COAST

SCHOOL OF AGRICULTURE

ANIMAL SCIENCE DEPARTMENT

Topic:

Performance, Challenges and Prospects along the Domestic Broiler Value Chain and Implications for Agricultural Graduate Employment in Ghana.

Introduction:

This questionnaire is aimed at assessing the current performance, challenges and opportunities along the local broiler value chain and the implications for job creation in Ghana

I would be grateful for your participation in this survey. The questions am going to ask concern broiler production and the broiler value chain activities in general; it would take about 30 minutes to go through these questions with you.

Participation voluntary:

Please also note that, participation in this survey is voluntary. For this reason you can choose not to answer any individual question or all of the questions. This notwithstanding, I look forward to your participation since your views are critical to this research.

Please, can I proceed to ask the questions? 1. Yes [ ] 2. No [ ]

Confidentiality Statement:

The data from you would be treated confidentially. Only the researcher, the supervisors and the enumerators will have access to the data. Your personal identity will be kept anonymous and be shielded from any other person or organization.

Contacts for Additional Information

If you have any question about the research please contact Mr. Bombason Kweku Tuoho- 0544294827 OR Prof. Julius Kofi Hagan- 0243253220.

Your rights as a Participant

This research has been reviewed and approved by the Institutional Review Board of University of Cape Coast (UCCIRB). If you have any questions about your rights as a research participant you can contact the Administrator at the IRB Office between the hours of 8:00 am and 4:30 p.m. through the phone lines 0558093143/0508878309 or email address: irb@ucc.edu.gh.

Name of region…….. Name of District……

Village/Town……

Date of interview ……....

Name of Respondent……

Telephone No ……...

Enumerator Name: _____

Section A: ***Demographic and Socio-Economic Characteristics of Poultry processors***

1. Sex of processing business owner. **Please tick [√].**
    1. Male [ ]
    2. Female [ ]

2. Marital status. **Please tick [√].** 1. Single [ ] 2. Married [ ] 3. Divorced [ ] 4. Widowed [ ] 5. Co habitation [ ]
3. Number of children? …… Male…… Female …….
4. Number of children who are in school…….
5. Please indicate the number of dependents (household size)
6. Please indicate age of processing business owner ……(in years)
7. Have you had any form of formal education? **Please tick [√].**
    1. Yes [ ]
    2. No [ ]
8. If yes, what is your highest level of education? **Please tick [√].**
    1. Basic Education [ ]
    2. Secondary/Technical or Vocational [ ]
    3. Tertiary [ ]
9. When was your processing business established? .....
10. Do you have an occupation other than poultry processing? **Please tick [√].**
    1. I don't have any other occupation [ ]
    2. Public or Civil Servant [ ]
    3. Private sector employee [ ]
    4. Other (Please specify) ……
11. Do you belong any poultry processing association? **Please tick [√].**
    1. Yes [ ]
    2. No [ ]

12. If a member of a poultry processing association/cooperative/ group? Do your membership helped you in your poultry processing business? **Please tick [√].** 1. Yes [ ] 2. No [ ]
13. If yes, in what ways? ……
14. Have you had any form of training from the association? (E.g. training on poultry processing, food safety, business management, etc.,) in the past three years? **Please tick [√].** 1. Yes [ ] 2.No [ ]
15. If yes, what type of training ……..
16. Please indicate the type of ownership of the site (building) of your operations. **Please tick [√].**
    1. Sole own site [ ]
    2. Family own site [ ]
    3. Rented site [ ]
    4. Own by the District Assembly [ ]
    5. Other (Please specify) ……..
17. How many poultry processing plants/facilities do you have?.....
18. What is your processing line for? **Please tick [√] all that apply**

    1. Meat only [ ] 2. Eggs only [ ] 3. Both [ ]
    4. Others (kindly specify) ……
19. If for meat only, what is the total processing capacity (potential) of your poultry processing plant/facility?.....
20. Please what is the current (actual) number of birds you process per day? ……

21. Please which of the following describes the type of labour you are using for your processing business. **Please tick [√].** 1. Family labour [ ] 2. Temporal hired labour [ ] 3. Permanent hired labour [ ] 4. Family labour and Temporal hired labour [ ] 5. Family labour and Permanent hired labour [ ] 6. Other (specify)……

22. How many workers do you have? Total..... Males___ Females____ workers under 36 years_____

23. How many people are working in the poultry processing plant/facility?.....

24. What type of products do you produce for sale? **Please tick [√].**

    1. Whole-dressed bird [ ]
    2. Cuts/parts [ ]
    3. Chicken fillets [ ]
    4. Chicken breast [ ]
    5. All the above [ ]
    6. Other (Specify)……..

25. Where do you get the live birds from? **Please tick [√].**

    1. Poultry farmers/producers located around [ ]
    2. Other Districts in this region [ ]
    3. Other regions [ ]
    4. Own farm [ ]
    5. Other (Specify)…….

26. How long does it take for the live birds to reach your processing facility from the producer's farm? **Please tick [√].**

    1. 1 hour [ ]

2. 2 hours [ ]
3. 3 hours [ ]
4. 4 hours [ ]
5. 5 hours [ ]
6. 6 hours [ ]
7. 7 hours [ ]
8. 1 day [ ]
9. Other (Specify)……

27. What means of transport do you use to convey the birds to your processing plant/facility?

Please tick [√].

1. Carry on head [ ]
2. Bicycle [ ]
3. Car [ ]
4. Truck [ ]
5. Taxi [ ]
6. Other (Specify)……

28. Do you carry out ante-mortem and post-mortem inspection before processing? **Please tick [√].** 1. Yes [ ] 2. No [ ]

29. If yes, how do you conduct it? **Please tick [√].**

1. Select all the sick birds and process the healthy ones [ ]
2. Others

Specify……...

30. Please, have you ever access credit? **Please tick [√].** 1. Yes [ ] 2. No [ ]

31. If yes, when was the last time you had access to credit? **Please tick [√].**

    1. 2021 [ ] 2. 2020 [ ] 3. 2019 or before [ ]

32. What was the means of repayment? **Please tick [√].** 1. Cash [ ]

    2.In-kind [ ]

33. What was the source of the credit? **Please tick [√].** 1. Banks/Savings and Loans/Microfinance/Credit union [ ] 2. Relatives [ ] 3. Colleagues poultry processors/friends [ ] 4. NGOs [ ] 5. Agro-input dealers [ ] 6. Poultry out-grower [ ] 7. Poultry processing/buying companies [ ]

34. Have you insured your business operations with an insurance company? **Please tick [√].** 1. Yes [ ] 2. No [ ]

35. If yes, which aspects of the business is ensured? **Please tick [√].**

    1. Building and equipment's [ ] 2. Processing of birds [ ] 3. Staff [ ] 4. All [ ]

36. If no, why?.....

Section B: Institutional and Regulatory Issues

1. Are you aware of any law/regulation governing the setting up of a broiler processing or slaughter facility in the country? **Please tick [√].** Yes [ ] 2. No [ ]

2. Do you have a permit or approval for your poultry broiler processing operations from any government agency or professional associations? **Please tick [√].** 1. Yes [ ] 2. No [ ]

3. Kindly indicate if your broiler processing plant/facility is regulated by any of the following government agencies or profession associations.

   Please tick [√] all that apply.

   1. Environmental Protection agency [ ]
   2. Food and drugs authority [ ]
   3. Ghana standard authority [ ]
   4. Veterinary services directorate [ ]
   5. Animal production directorate [ ]
   6. Poultry processors association of Ghana [ ]
   7. District Assembly [ ]
   8. Environmental Health Department [ ]

4. If you got approval or permit from any government agency or professional associations before starting your operations, kindly rate your experience?

Item	**Please tick [√]**
Service delivery	
Poor	
Good	
Very Good	
Excellent	
Cost of services	
Low	
Moderate	
High	
Very high	

Section C: Cost of Production, Output and Sales last years

1. Fixed inputs used for a typical processing cycle of broiler

Fixed inputs	**Quantity**	**Unit cost (GH¢)**	**Total cost (GH¢)**
Site (Land & buildings)			
standby generator,			
delivery van (cold van),			
certification and business, registration			
lairage,			
office space and installation			
Computer(s)			
working gears			
Communication (telephone)			
holding cage			
de-feathering (plucker)			
cutting knives			
storage facility (container)			
Refrigerator/freezer			
Other (Specify)			

2. Variable inputs used for a typical processing cycle of broiler

Variable inputs	**Quantity**	**Unit cost (GH¢)**	**Total cost (GH¢)**
Labour			
materials, maintenance and other overhead cost (percentage of investment cost),			
Electricity			
supervision from institutions (EPA,FDA,VSD)			
water and sewage			
broiler (raw materials),			
Packaging materials			
transportation			
marketing and advertisement			
Other (Specify)			

3. What is the quantity of birds processed in a day?.....
4. How much do you sell a processed bird?
    1. Whole..... (GH¢)
    2. Per Kg…… (GH¢)
5. Do you have an agreement with any person or business to supply your product (dressed chicken) to? **Please tick [√].**
    1. Yes [ ]
    2. No [ ]
6. If yes, what type of agreement is it? **Please tick [√].**
    1. Verbal/word of mouth [ ]
    2. Written agreement [ ]
    3. Others (specify)…….

7. Do you process birds for people for a fee either than selling it? **Please tick [√].**

1. Yes [ ] 2. No [ ]

8. Do you think there is ready market for the product (dressed birds/chicken cuts)?

Please tick [√]. 1. Yes [ ] 2. No [ ]

9. If no why?.....

10. If yes, explain …….

11. Do you consider access to market before processing birds? **Please tick [√].**

1. Yes [ ] 2. No [ ]

12. Who sets the markets price? **Please tick [√].** 1. Regulated price by third party [ ] 2. Market forces [ ] 3. Self [ ] 4. Other actors …….

13. How would you rate the unit price at which you sold your live birds? **Please tick [√].** 1. Higher than your expected [ ] 2. Lower than your expected [ ] 3. Meet your expectation [ ] 4. Moderate [ ]

14. Please, are you producing the quantity and quality that is well demanded in the market? **Please tick [√].** 1. Yes [ ] 2. No [ ].

15. How do customers/clients pay for the dressed birds/chicken cuts they buy? **Please tick [√].** 1. Cash on delivery [ ] 2. Mobile money on delivery 3. Credit [ ] 4. Contract [ ] 5. Other (specify)……..

16. Please provide your sales or marketing information in any of the applicable columns in the table below

Number or quantity of whole dressed Birds (if whole dressed birds are sold)	Average price per bird /Kg (GH¢)	Total cost (GH¢)
Quantity of chicken cuts/parts (if chicken cuts are sold)	Average price per bird /Kg (GH¢)	Total cost (GH¢)
Quantity of processed chicken(sausage, seasoned, caned, smoked/roasted)	Average price per bird /Kg (GH¢)	Total cost (GH¢)

Section D: Production and Marketing Constraints to Broiler Processing

1. Indicate the extent to which you agree or disagree with the existence of the following constraints of broiler processing? **(Enumerator please note; circle only one answer in each row)**

1.1 Production Constraints of Broiler Processing

Constraints	**Strongly Agree**	**Agree**	**Somewhat agree**	**Disagree**	**Strongly Disagree**
Lack of raw material (live birds)	1	2	3	4	5
Poor quality raw materials	1	2	3	4	5
High cost of raw materials	1	2	3	4	5
Limited knowledge on	1	2	3	4	5

how to process quality products					
Lack of proper packaging materials	1	2	3	4	5
Inadequate transport infrastructure	1	2	3	4	5
Lack of funds to buy equipment	1	2	3	4	5
High cost of equipment	1	2	3	4	5
Lack of electricity	1	2	3	4	5
High cost of electricity	1	2	3	4	5
Lack of entrepreneurial training	1	2	3	4	5

1.2 Marketing Constraints of Broiler Processing

Constraints	**Strongly Agree**	**Agree**	**Somewhat agree**	**Disagree**	**Strongly Disagree**
Lack of access to current market information	1	2	3	4	5
Competition from imported frozen chicken	1	2	3	4	5
Consumer taste and preference	1	2	3	4	5
Time and convenience	1	2	3	4	5
Lack of freezers and refrigerators	1	2	3	4	5
Poor handling and packaging system	1	2	3	4	5
Consumers are mostly driven by price not quality and safety	1	2	3	4	5
Only a small fraction of the population are influenced by health and safety issues on decisions regarding what they consume	1	2	3	4	5
High cost of raw materials (broiler) leads high cost of the final products (dressed or cut chicken)	1	2	3	4	5

Appendix E

Structured Interview Schedule for Live Birds Sellers/Marketers
UNIVERSITY OF CAPE COAST

SCHOOL OF AGRICULTURE

ANIMAL SCIENCE DEPARTMENT

Topic:

Performance, Challenges and Prospects along the Domestic Broiler Value Chain and Implications for Agricultural Graduate Employment in Ghana.

Introduction:

This questionnaire is aimed at assessing the current performance, challenges and opportunities along the local broiler value chain and the implications for job creation in Ghana

I would be grateful for your participation in this survey. The questions am going to ask concern broiler production and the broiler value chain activities in general; it would take about 30 minutes to go through these questions with you.

Participation voluntary:

Please also note that, participation in this survey is voluntary. For this reason you can choose not to answer any individual question or all of the questions. This notwithstanding, I look forward to your participation since your views are critical to this research.

Please, can I proceed to ask the questions? 1. Yes [ ] 2. No [ ]

Confidentiality Statement:

The data from you would be treated confidentially. Only the researcher, the supervisors and the enumerators will have access to the data. Your personal identity will be kept anonymous and be shielded from any other person or organization.

Contacts for Additional Information

If you have any question about the research please contact Mr. Bombason Kweku Tuoho- 0544294827 OR Prof. Julius Kofi Hagan- 0243253220.

Your rights as a Participant

This research has been reviewed and approved by the Institutional Review Board of University of Cape Coast (UCCIRB). If you have any questions about your rights as a research participant you can contact the Administrator at the IRB Office between the hours of 8:00 am and 4:30 p.m. through the phone lines 0558093143/0508878309 or email address: irb@ucc.edu.gh.

Name of region…… Name of District……

Village/Town……

Date of interview ……....

Name of Respondent……

Telephone No ……...

Enumerator Name: _____

Section A: ***Demographic and Socio-Economic Characteristics of Poultry marketers***

1. Sex of marketing business owner. **Please tick [√].**
    1. Male [ ]
    2. Female [ ]

2. Marital status. **Please tick [√].** 1. Single [ ] 2. Married [ ] 3. Divorced [ ]

   4. Widowed [ ] 5. Co habitation [ ]

3. Number of children? …… Male…… Female …….
4. Number of children who are in school…….
5. Please indicate the number of dependents (household size)……..
6. Please indicate age of marketing/trade business owner

   …… (in years)

7. How long has your firm or company been involved in marketing of live birds/chicken meat and products …… (in years)
8. Have you had any form of formal education (i.e. the business owner)? **Please tick [√].**

   1. Yes [ ]
   2. No [ ]

9. If yes, what is your highest level of education? **Please tick [√].**

   1. Basic Education [ ]
   2. Secondary/Technical or Vocational [ ]
   3. Tertiary [ ]

10. Which year was your live birds marketing/trade business established? ……

11. What type of live birds do you market? **Please tick [√].**

    1. broiler [ ]
    2. Spent layer [ ]
    3. Cockerel [ ]
    4. Local birds

12. What other occupation do you have apart from the marketing of live birds? **Please tick [√].**
    1. I don't have any other occupation [ ]
    2. Public or Civil Servant [ ]
    3. Private sector employee [ ]
    4. Other (Please specify) ……
13. Do you belong to a live bird's sellers/traders/marketers association? **Please tick [√].**
    1. Yes [ ] 2. No [ ]
14. If a member of a live bird's sellers/traders/marketers association? Do your membership help you in your live bird's selling business? **Please tick [√].** 1.Yes [ ]
    2. No [ ]
15. If yes, in what ways? ……
16. Have you had any form of training from the association? (E.g business management, customer care etc.,) in the past three years? **Please tick [√].** 1. Yes [ ] 2. No [ ]
17. If yes, what type of training ……..
18. How many markets do you sell in? **Please tick [√].**
    1. One (1) [ ]
    2. Two (2) [ ]
    3. Three (3) [ ]
    4. Four (4) and above [ ]
19. Please indicate the type of ownership of the site /spot of your operations. **Please tick [√].**

1. Sole own site [ ]
2. Family own site [ ]
3. Rented site [ ]
4. Own by the District Assembly [ ]
5. Other (Please specify) ……..

20. What is the total capacity (potential) of live birds you can take in your facility?.....
21. Please what is the current (actual) number of live birds you are sell per day? ……
22. How many workers do you have? Total..... Males___ Females____ workers under 36 years_____
23. Please, have you ever access credit? **Please tick [√].** 1. Yes [ ] 2. No [ ]
24. If yes, when was the last time you had access to credit? **Please tick [√].** 1.2021 [ ] 2. The 2020 [ ] 3.2019 or before [ ]
25. What was the means of repayment? **Please tick [√].** 1. Cash [ ] 2.In-kind [ ]
26. What was the source of the credit? **Please tick [√].** 1. Banks/Savings and Loans/Microfinance/Credit Union [ ] 2. Relatives [ ] 3. Colleague live bird seller/friends [ ] 4. NGOs 5. Agro-input dealers [ ] 6. Poultry out-grower [ ]
    7. Poultry processing/buying companies [ ]
27. Have you insured your business (live bird selling) operations with an insurance company? **Please tick [√].** 1. Yes [ ] 2. No [ ]

28. If yes, which aspects of the business is insured? 1. Building and equipment's [ ] 2. Live birds for sale [ ] 3. Staff [ ] 4. All [ ]
29. If no, why?.....
30. Where do you get the live birds from? **Please tick [√].**
    1. Own farm [ ]
    2. Poultry farmers/producers located around [ ]
    3. Other Districts in this region [ ]
    4. Other regions [ ]
    5. Other (Specify)…….
31. How long does it take for the live birds to reach you from the producer's farm? **Please tick [√].**
    1. 1 hour [ ]
    2. 2 hours [ ]
    3. 3 hours [ ]
    4. 4 hours [ ]
    5. 5 hours [ ]
    6. 6 hours [ ]
    7. 7 hours [ ]
    8. 1 day [ ]
    9. Other (Specify)……

Section B: Institutional and Regulatory Issues

8. Are you aware of any law/regulation governing the marketing of live birds in the country? **Please tick [√].** 1.Yes [ ] 2. No [ ]

9. Do you have a permit or approval for your marketing of live birds operations from any government agency or professional associations?

Please tick [√].

10. Yes [ ]

11. No [ ]

12. Kindly indicate if your live birds marketing business is regulated by any of the following government agencies or professional associations.

Please tick [√] all that apply.

1. Environmental Protection agency [ ]
2. Food and drugs authority [ ]
3. Ghana standard authority [ ]
4. Veterinary services directorate [ ]
5. Animal production directorate [ ]
6. Live Birds Sellers Association of Ghana [ ]
7. District Assembly [ ]
8. Environmental Health Department [ ]

4. If you got approval or permit from any government agency or professional associations before starting your operations, kindly rate your experience?

Item	**Please tick [√]**
Service delivery	
Poor	
Good	
Very Good	
Excellent	
Cost of services	
Low	
Moderate	
High	
Very high	

Section C: Marketing channels of live birds

1. In what form do you sell the birds? **Please tick [√].**
    1. Live bird [ ]
    2. Fresh dressed-whole bird [ ]
    3. Fresh chicken cuts/part [ ]
    4. Frozen whole-dressed bird [ ]
    5. Frozen chicken cuts/parts [ ]
    6. Other (specify)……
2. Please indicate who you sell your live birds to?

	Product	Buyer	Please tick (√) all that applies
1.	Live bird	Direct-to-consumer	
		Retailers	
		Whole-sealers	
		Hotels	
		Restaurants	
		Institutions	
		Chop-bars	
		Processors	
		Hawkers	
		Others (specify)	
3.	Others (specify)		

3. Where do you sell your live birds? **Please tick [√].**
    1. Live birds market [ ]
    2. Road side [ ]
    3. Village market [ ]
    4. Town market [ ]
    5. Farm gate [ ]
    6. Other (specify)……

Section D: Marketing Margins

1. What are your units/form of sale? **Please tick [√].**
    1. Whole bird [ ]
    2. Per Kg [ ]
    3. A lot of 10 [ ]
    4. Other (Specify)……..
2. Do you grade your birds? **Please tick [√].** …. 1. Yes [ ] 2. No [ ]
3. If yes, how do you grade your birds for sale?
    1. Size/appearance [ ]
    2. Weight [ ]
    3. Selecting healthy ones [ ]
    4. Hand weighing [ ]
    5. Other (specify)…….
4. What number of live birds do you sell per day? .....
5. At what price do you sell your birds?

Units/form of sale	**GH¢**
Live bird	
Others (Specify)…….	

6. When transporting your birds to the market, what kind of transportation do you use? **Please tick [√].**
    1. Carry on head [ ]
    2. Bicycle [ ]
    3. Car [ ]
    4. Truck [ ]
    5. Taxi [ ]
    6. Other (Specify)…….

8. Please complete the table below on the fixed cost incurred in marketing 50, 100, 500 or 1000 live birds (please choose the figure applicable)

Type of marketing cost	**Quantity**	**Unit cost (GH¢)**	**Total cost (GH¢)**
marketing shed/ building			
Site renting/Market toll			
Other (Specify)			

9. Please complete the table below on the variable cost incurred in marketing 50, 100, 500 or 1000 live birds (please choose the figure applicable)

Type of marketing cost	**Quantity**	**Unit cost (GH¢)**	**Total cost (GH¢)**
Cost of labour			
Cost of live birds			
Transportation			
Feed			
Loading			
Off-loading			
Packaging material			
Storage cost			
Electricity			
Advertising cost			
Maintenance cost			
Other (Specify)			

10. Do you have an agreement with any person or business to supply your product (live birds) to? **Please tick [√].**

1. Yes [ ]
2. No [ ]

11. If yes, what type of agreement is it? **Please tick [√].**

1. Verbal/word of mouth [ ]
2. Written agreement [ ]
3. Others (specify)…….

12. Do you think there is ready market for the product (live birds)? **Please tick [√].**

    1. Yes [ ] 2.No [ ]

13. If no why?.....

14. If yes, explain …….

15. Do you consider access to market before taking delivery of live birds? **Please tick [√].**

    1. Yes [ ]

    2. No [ ]

16. Who sets the markets price? **Please tick [√].** 1. Regulated price by third party [ ] 2. Market forces [ ] 3. Self [ ] 4. Other actors [ ]

17. How would you rate the unit price at which you sold your live birds? **Please tick [√].** 1. Higher than your expected [ ] 2. Lower than your expected [ ] 3. Meet your expectation [ ] 4. Moderate [ ]

18. Which of the following drive the demand for your live birds (products)? **Please tick [√].** 1. Quality [ ] 2. Quantity [ ] 3. Both quality and quantity 4. Others (specify……

19. How do customers/clients pay for the live birds they buy? **Please tick [√].** 1. Cash on delivery [ ] 2. Mobile Money on delivery 3.Credit [ ] 4. Contract [ ] 5. Other (specify)……..

Section E: Constraints in marketing of live birds

1. Indicate the extent to which you agree or disagree with the existence of the following constraints regarding the marketing of birds live birds? (Enumerator please note; circle only one answer in each row)

Constraints	Strongly Agree	Agree	Somewhat agree	Disagree	Disagree Strongly
Competition with imported chicken	1	2	3	4	5
Consumer taste and preference	1	2	3	4	5
Poor storage/holding pens	1	2	3	4	5
High cost of electricity	1	2	3	4	5
Lack of constant supply of electricity	1	2	3	4	5
High cost of fuel	1	2	3	4	5
High cost of transportation	1	2	3	4	5
Lack of freezers and refrigerators	1	2	3	4	5
Poor handling and packaging system	1	2	3	4	5
Limited marketing channels	1	2	3	4	5
Higher taxes	1	2	3	4	5
Marketing site location	1	2	3	4	5
Higher cost of feed	1	2	3	4	5

Appendix F

Interview Questionnaire for Final Year University Students

UNIVERSITY OF CAPE COAST

SCHOOL OF AGRICULTURE

ANIMAL SCIENCE DEPARTMENT

Topic:

Performance, Challenges and Prospects along the Domestic Broiler Value Chain and Implications for Agricultural Graduate Employment in Ghana.

Introduction:

This interview schedule is aimed at assessing the current performance, challenges and opportunities along the local broiler value chain and the implications for job creation in Ghana.

I would be grateful for your participation in this survey. The questions concern broiler production and broiler value chain activities in general, it would take about 30 minutes to go through these questions with you.

Participation voluntary:

Please also note that, participation in this survey is voluntary, for this reason you can choose not to answer any individual question or all of the questions. This notwithstanding, I look forward to your participation since your views are critical to this research.

Please tick to confirm your participation. 1. Yes [ ] 2. No [ ]

Confidentiality Statement:

The data from you would be treated confidentially. Only the researcher, the supervisors and the enumerators will have access to the data. Your personal identity will be kept anonymous and be shielded from any other person or organization.

Contacts for Additional Information

If you have any question about the research please contact Mr. Bombason Kweku Tuoho- 0544294827 OR Prof. Julius Kofi Hagan- 0243253220.

Your rights as a Participant

This research has been reviewed and approved by the Institutional Review Board of University of Cape Coast (UCCIRB). If you have any questions about your rights as a research participant you can contact the Administrator at the IRB Office between the hours of 8:00 am and 4:30 p.m. through the phone lines 0558093143/0508878309 or email address: irb@ucc.edu.gh.

***University*……**

***Name of Respondent*……**

***Telephone No* ……..**

***Date of interview* ……..**

Demographic and Socio-Economic Characteristics of final year University Students

1. Sex 1. Male [ ] 2. Female [ ]. **Please tick [√].**

2. Please indicate your age at your last birthday…… (in years)

3. Kindly indicate your marital status. **Please tick [√].** 1. Single [ ] 2. Married [ ]

3. Divorced [ ] 4.Widowed [ ] 5. Co- habitation [ ]

4. Please indicate your household size …….
5. Number of children …… Male…….. Female …….
6. Please where do you live? ……..
7. How would you describe the place you live? **Please tick [√].** 1. Urban area [ ] 2. Rural area [ ]
8. Please, what year/level are you in the University? **Please tick [√].**

   1. Level 100 [ ] 2. Level 200 [ ] 3. Level 300 [ ] 4. Level 400 [ ]
9. What programme or course are you studying?.....
10. Please, where do your parents or guardian live? **Please tick [√].**

    1. Urban area [ ] 2. Rural area [ ]
11. Please what is the main occupation of your parents? **Please tick [√] all that apply.** 1. Farming (Crops/animals) [ ] 2. Construction worker/artisan [ ] 3. Trading/commerce [ ] 4. Public or Civil Servant [ ] 5.Formal Private sector employment [ ] 6. Other (Please specify) ……
12. If parents are livestock farmers, please indicate the type (**tick [√] all that apply**).

    1. Poultry [ ] 2. Small ruminants [ ] 3. Cattle [ ] 4. Pigs [ ]
    5. All the above [ ] 6. Other (please specify)…….
13. During your course of study in the university, have you been taught poultry production particularly broiler production and its' related value chain activities? Please tick [√]. 1. Yes [ ] 2. No [ ]
14. If yes, please kindly rate your knowledge level in the tabulated broiler value chain activities

Activity	Poor	Good	Very Good	Excellent
Inputs Production and Distribution				
Feed milling (toll feed processing)				
Feed manufacturing				
Importation and distribution of feed (Marketing)				
Local distribution of feed (Marketing)				
Feed ingredients importation and distribution (Marketing)				
Local feed ingredients aggregation and distribution (Marketing)				
Veterinary drugs and vaccine importation and distribution (Marketing)				
Local distribution of veterinary drugs and vaccines (Marketing)				
Importation and distribution of fertile hacherble eggs (Marketing)				
Importation and distribution of day old chicks				
Hatching and distribution of day old chicks locally				
Operating a broiler parent stock/holding farm to produce locally fertile hacherble eggs				
Broiler Production Activities				
Brooding of broiler from week zero (0) to week four (4)				
Raising broiler from week four (4) to week eight (8)				
Raising broiler from week zero (0) to week eight (8)				
Broiler Processing Activities				
Whole dressing of birds				
Dressing and cutting of birds into chicken parts				
Marketing of broiler Activities				
Live birds selling				
Dressed whole or chicken cuts for sale (operating a cold store for locally produced broilers)				
Waste management Activities				
Converting broiler dropping into manure				
Using broiler dropping to generate energy				
Converting furthers and visceral from broiler processing to feed for other animals				
Provision of Support services				

Construction of poultry houses				
Local production/fabrication of lighting systems, egg, drinkers, feeders, etc.)				
Importation and distribution of lighting systems, egg, drinkers, feeders, etc.)				
Distribution of locally produced/fabricated, lighting systems, drinkers, feeders, etc.)				
Communication-advertising of broiler production inputs and products				
Provision of business development services to broiler value chain actors				
Provision of animal husbandry and nutritional services (training & advisory)				
Transportation of production inputs and products of the broiler value chain				

15. Are you engaged in any economic activity currently? **Please tick [√].**

    1. Yes [ ] 2. No [ ]

16. If yes, what work is it? **Please tick [√].** 1. Farming (crops/animals) [ ]

    2. Construction worker/artisan [ ] 3.Trading/commerce [ ]

    4. Public or Civil Servant [ ] 5. Formal Private sector employment [ ]

    7. National service [ ] 8. Apprentice [ ] 9. Other (Please specify)

    …….

17. What work (occupation) were you doing before switching to your current work? **Please tick [√].** 1. None [ ] 2. Crop Farming [ ]

    3. Livestock farming [ ]

    4. Construction worker/artisan [ ] 5.Trading/commerce [ ]

    6. Public or Civil Servant [ ] 7.Formal Private sector employment [ ]

    8. National service [ ] 9.Other (Please specify) ……

18. If livestock farming, please indicate the type (**tick [√] all that is applicable**).

    1. Poultry [ ] 2. Small ruminants [ ] 3. Cattle [ ] 4. Pigs [ ]

    5. All the above [ ] 6. Others (please specify)…….

19. If under apprenticeship, what do you want to do after completion?

    Please tick [√]. 1. Peruse a Master's degree immediately [ ] 2. Seek employment in Public or Civil Service [ ] 3. Seek employment in private sector [ ] 4. Start my own business or enterprise [ ] 5. Others_____

20. Which of the following statements best describes your job aspirations in the next five years? **Please tick [√].** I would like to start my own business [ ] 2. I would like to work in a government department or agency [ ] 3. I would like to work for a private company [ ] 4. Others (specify_____

21. If you had the opportunity to start your own business or enterprise, what type of business

    Would it be? **Please tick [√].** 1. Construction business [ ] 2.Oil and gas business [ ] 3. Agribusiness [ ] 4. Hospitality business [ ] 5.Transport business [ ] 6.Others (specify_____

22. Please would you want to go into poultry production as a vocation or your source of livelihood? **Please tick [√].** 1. Yes [ ] 2. No [ ]

23. If no, what is your main reason? **Please tick [√].** 1. I do not have the needed capital [ ] 2. I lack the requisite technical know-how [ ] 3. It is below my status [ ]

4. I just don't like it [ ] 5. My family members will not agree [ ]

6. My friends will laugh at me [ ] 7. Others_____

24. If yes to poultry business, please rank the top five (5) value chain activities you are interested in (1=most preferred, 2=2nd preferred and 3=3rd preferred 4=4th preferred 5=5th preferred) (**Enumerator please note; rank only five)**

Activities	Rank
Inputs Production and Distribution	
Feed milling (toll feed processing)	
Feed manufacturer	
Importation and distribution of feed (Marketing)	
Local distribution of feed (Marketing)	
Feed ingredients importation and distribution (Marketing)	
Local feed ingredient aggregation and distribution (Marketing)	
Veterinary drugs and vaccine importation and distribution (Marketing)	
Local distribution of veterinary drugs and vaccines (Marketing)	
Importation and distribution of fertile hacherble eggs (Marketing)	
Importation and distribution of day old chicks	
Hatching and distribution of day old chicks locally	
Operating a broiler parent stock/holding farm to produce locally fertile hacherble eggs	
Broiler Production Activities	
Brooding of broiler from week zero (0) to week four (4)	
Raising broiler from week four (4) to week eight (8)	
Raising broiler from week zero (0) to week eight (8)	
Broiler Processing Activities	
Whole dressing of birds	
Dressing and cutting of birds into chicken parts	
Marketing of broiler Activities	
Live birds selling	
Dressed whole or chicken cuts for sale (operating a cold store for locally produced broilers)	
Waste management Activities	
Converting broiler dropping into manure	
Using broiler dropping to generate energy	
Converting furthers and visceral from broiler processing to feed for	

other animals	
Provision of Support services	
Construction of poultry houses	
Local production/fabrication of lighting systems, drinkers, feeders, etc.)	
Importation and distribution of lighting systems, drinkers, feeders, etc.)	
Distribution of locally produced/fabricated, lighting systems, drinkers, feeders, etc.)	
Communication-advertising of broiler production inputs and products	
Provision of business development services to broiler value chain actors	
Provision of animal husbandry and nutritional services (training & advisory)	
Transportation of production inputs and products of the broiler value chain	

25. Please on the scale of one to five (1-5), where 1= Strongly Disagree, 2= Disagree, 3= Somewhat Agree, 4= Agree, 5= Strongly Agree. Rank the following tabulated statements to show your level of agreement to factors that influence your perception on the involvement the youth in broiler value chain activities.

Statement	**Strongly disagree**	**Disagree**	**Somewhat agree**	**Agree**	**Strongly agree**
Socio-cultural perceptions					
My parents told me not to be involved in any farming or agriculture related activity as a business or employment	1	2	3	4	5
Broiler value chain businesses are not respected	1	2	3	4	5
Broiler value chain jobs are dirty to do	1	2	3	4	5
Broiler value chain jobs are for older people	1	2	3	4	5
Broiler businesses are for poor people	1	2	3	4	5
Broiler production is job for males	1	2	3	4	5
Feed milling job is for males	1	2	3	4	5
Females are supposed to carry out poultry processing in the broiler value chain	1	2	3	4	5

Females are supposed to carry out marketing activities in the broiler value chain	1	2	3	4	5
Broiler value chain jobs are difficult or more demanding	1	2	3	4	5
Broiler farming makes you poor	1	2	3	4	5
Farmers work hard for little reward	1	2	3	4	5
Broiler production is for school dropouts and illiterates.	1	2	3	4	5
Broiler production is for the less privileged in the society.	1	2	3	4	5
Economic perceptions					
Broiler value chain businesses are not profitable	1	2	3	4	5
Broiler value chain business is a high risk one due to disease out breaks	1	2	3	4	5
The depreciation of the Ghana cedis may increase cost of production and rendering the business unsustainable	1	2	3	4	5
Broiler value chain jobs are not well paying	1	2	3	4	5
Broiler value chain businesses are capital intensive, because of this young people cannot start such a business on their own	1	2	3	4	5
High feed cost would affect the business turn over (profitability)	1	2	3	4	5
Whole scale importation of poultry production inputs makes broiler value chain business frustrating to young starters	1	2	3	4	5
Government Policy Perceptions					
Government has no consistent poultry production policy	1	2	3	4	5
There is not sufficient extension support to poultry producers	1	2	3	4	5
There is little or no use of technology & machines in broiler production in Ghana	1	2	3	4	5
The poultry industry is not a priority to Government of Ghana	1	2	3	4	5
Ghana government has no import substitution policy to reduce and eliminate importation of frozen chicken into Ghana	1	2	3	4	5
Local broiler business are not given subsidies to lower their cost of production as such unable to compete with foreign frozen chicken imports	1	2	3	4	5
University education does not adequately prepare first degree holders to start their own businesses on the	1	2	3	4	5

broiler value chain					
Resource availability					
It is easy not for young people to access credit to start or scale-up broiler production	1	2	3	4	5
Young people have no easy access to get land for broiler value chain activities	1	2	3	4	5
Information needed to support Broiler value chain activities are not easily available to young people	1	2	3	4	5
Production inputs are not readily available	3	2	3	4	5
It is not easy to sell broiler meat and meat products in Ghana	1	2		4	5
It is not easy to sell live broiler in Ghana	1	2	3	4	5
There are no broiler processing plants/factories in my region	1	2	3	4	5

Appendix G

Ethical Clearance Approval Letter

UNIVERSITY OF CAPE COAST
INSTITUTIONAL REVIEW BOARD SECRETARIAT
TEL.: 0558093143 / 0508878309
E-MAIL.: irb@ucc.edu.gh
OUR REF: UCC/IRB/A/2016/1190
YOUR REF:
OMB NO: 0990-0279
IORG #: IORG0009096

21ST DECEMBER, 2021

Mr. Bombason Kweku Tuoho
Department of Animal Science
University of Cape Coast

Dear Mr. Tuoho,

ETHICAL CLEARANCE – ID (UCCIRB/CANS/2021/35)

The University of Cape Coast Institutional Review Board (UCCIRB) has granted Provisional Approval for the implementation of your research titled ***Performance, Challenges and Prospects along the Domestic Broiler Value Chain and Implications for Employment Generation in Ghana.*** This approval is valid from 21st December, 2021 to 20th December, 2022. You may apply for a renewal subject to submission of all the required documents that will be prescribed by the UCCIRB.

Please note that any modification to the project must be submitted to the UCCIRB for review and approval before its implementation. You are required to submit periodic review of the protocol to the Board and a final full review to the UCCIRB on completion of the research. The UCCIRB may observe or cause to be observed procedures and records of the research during and after implementation.

You are also required to report all serious adverse events related to this study to the UCCIRB within seven days verbally and fourteen days in writing.

Always quote the protocol identification number in all future correspondence with us in relation to this protocol.

Yours faithfully,

Samuel Asiedu Owusu, PhD
UCCIRB Administrator

ADMINISTRATOR
INSTITUTIONAL REVIEW BOARD
UNIVERSITY OF CAPE COAST

Appendix H
Demographic Characteristics of Feed Millers

Variables	Categories	f	%
Region	Greater Accra	13	24.1
	Ashanti	13	24.1
	Bono	28	51.9
	Total	54	100.0
Sex	Male	48	88.9
	Female	6	11.1
	Total	54	100.0
Marital Status	Single	10	18.5
	Married	42	77.8
	Widowed	2	3.7
	Total	54	100.0
Have you had any formal education	Yes	49	90.7
	No	5	9.3
	Total	54	100.0
Level of education	Basic education	9	16.7
	Secondary/ Technical or vocational	18	33.3
	Tertiary	24	44.4
	Total	51	94.4
Do you belong to a feed-millers cooperative or association	Yes	17	31.5
	No	37	68.6
	Total	54	100
Does membership help you in your feed milling business	Yes	12	22.2
	No	42	77.8
	Total	54	100
Have you received any training from the association in the past three years	Yes	12	22.2
	No	32	77.8
	Total	54	100

Source: Field survey, Tuoho (2022).

Appendix I

Access to Credit and Insurance by Feed Millers

Variable	Categories	f	%
Have you ever accessed credit	Yes	16	29.6
	No	38	70.4
	Total	54	100.0
When last did you get access to credit	2021	6	11.1
	2020	1	1.9
	2019 or before	8	14.8
Has your business been insured	Yes	20	37.0
	No	34	63.0
	Total		
Aspect of business insured	Building and equipment's	7	13.0
	Feed milling	9	16.7
	Saff	-	-
	All	8	11.1
	No	32	59.2
	Total	54	100.0

Source: Field survey, Tuoho (2022).

Appendix J
Purpose of Feed Milling by Feed Millers

Variable		f	%
	Milling for a fee (toll)	28	51.9
	Milling to sell	6	11.1
	Milling for a fee & selling	13	24.0
	Milling for own farm use (integrated farms)	7	13.0
	Total	54	100.0

Appendix K

Types of Feed Milled by Feed Millers

Variables	Categories	F	%
Manufacture grower mash	No	8	14.8
	Yes	41	75.9
	Total	49	90.7
Manufacture chick mash	No	35	64.8
	Yes	14	25.9
	Total	49	90.7
Mill broiler starter	No	33	61.1
	Yes	16	29.6
	Total	49	90.7
Mill broiler finisher	No	8	14.8
	Yes	41	75.9
	Total	49	90.7
Mill other feed	No	42	77.8
	Yes	7	13.0
	Total	49	90.7
Specify		47	87.0
	All poultry feed	1	1.9
	All type of food	1	1.9
	Any type of feed	1	1.9
	Concentrates	1	1.9
	Horse, Pig and others	1	1.9
	Pig and Rabbit feeds	1	1.9
	Pig feed	1	1.9
	Total	54	100.0

Source: Field survey, Tuoho (2022).

Appendix L

Knowledge on Regulations and Regulatory Agencies

Variables	Categories	f	%
Aware of laws/regulations governing feed milling	Yes	50	92.6
	No	4	7.4
	Total	54	100.0
Require a permit	Yes	44	81.5
	No	10	18.5
	Total	54	100.0
Regulated by EPA	No	42	77.8
	Yes	12	22.2
	Total	54	100.0
Regulated by FDA	No	42	77.8
	Yes	12	22.2
	Total	54	100.0
Regulated by GSA	No	44	81.5
	Yes	10	18.5
	Total	54	100.0
Regulated by VSD	No	39	72.2
	Yes	15	27.8
	Total	54	100.0
Regulated by APD	No	41	75.9
	Yes	13	24.1
	Total	54	100.0
Regulated by Feed Millers Asso.	No	47	87.0
	Yes	7	13.0
	Total	54	100.0
Regulated by DA	No	4	7.4
	Yes	50	92.6
	Total	54	100.0
Regulated by EHD	No	46	85.2
	Yes	8	14.8
	Total	54	100.0
Service delivery	Poor	5	8.7
	Good	20	37.0
	Very Good	28	51.9
	Excellent	1	1.9
	Total	49	90.7
Cost of service	Low	5	9.3
	Moderate	43	79.6
	High	5	9.3
	Very high	1	1.9
	Total	54	100.0

Source: Field survey, Tuoho (2022).

Appendix M

Socio-Economic Characteristics of Feed Millers

	n	Minimum	Maximum	Mean	Std. Deviation
Age of feed miller owner	50	30	80	52.02	9.321
Number of metric tonnes(mt) mill per week by toll feed mills	38	.50	60.00	10.8026	9.68667
Number of metric tonnes(mt) are mill per month by toll feed mills	22	3	360	69.50	77.413
Number of metric tonnes(mt) are mill per year by toll feed mills	12	12	1300	319.50	355.079
Fee charged per metric tonn of feed milled	31	2.50	2500.00	123.3065	441.43015
Total operational (potential) capacity of feed mills (Mt)	52	1.00	250.00	10.6442	34.33148
Current production capacity of feed mills (Mt)	51	1.00	150.00	7.0784	20.64276
Total production per cycle (tonnage) by commercial feed mills	16	1.50	420.00	66.7188	136.49322
Total number of workers	52	1	20	5.12	3.776
Number of male workers	52	1	20	4.67	3.552
Number of female workers	48	0	3	.50	.923
Number of workers under 36 years	49	0	12	3.31	2.493

Source: Field survey, Tuoho (2022)

Appendix N

Demographic characteristics of broiler producers

Variable	Categories	f	%
Region	Ashanti	105	37.0
	Bono	39	13.7
	Greater Accra	140	49.3
	Total	284	100.0
Sex	Male	232	82.02
	Female	52	17.98
	Total	284	100.0
Marital status	Single	38	13.4
	Married	232	81.7
	Divorced	6	2.1
	Widowed	8	2.8
	Total	284	100.0
Have you had any formal education	Yes	259	91.2
	No	23	8.1
	Total	284	100.0
Level of education	Basic education	77	25.4
	Secondary/Technical or Vocational	73	25.7
	Tertiary	139	48.9
	Total	284	100.0
Other occupation	I don't have any other occupation	104	36.6
	Public or Civil servant	45	15.8
	Private sector employee	76	26.8
	Other	59	20.8
	Total	284	100.0
Do you belong to any poultry cooperative/association	Yes	143	50.4
	No	141	49.7
	Total	284	100.0
Does the membership help you in your poultry production business	Yes	133	46.8
	No	151	53.2
	Total	284	100.0
Have you received any training from the association in the past three years	Yes	142	50.0
	No	142	50.0
	Total	284	100.0
	Type of production system		
What type of production phase are you practicing in your farm	Starter phase	2	0.7
	Finisher phase	9	3.2
	Starter to finisher phase	273	96.1
	Total	284	100.0
	Source of labour		
Do you use family labour on the farm	No	185	65.1
	Yes	99	34.9
	Total	284	100.0
Do you have access to extension services	Yes	248	87.3
	No	36	12.7
	Total	284	100.0
	Total	284	100.0

Source: Field survey, Tuoho (2022).

Appendix O

Access to Credit and Insurance by Broiler Producers

Variable	Categories	f	%
Have you ever accessed credit	Yes	62	21.9
	No	222	78.2
	Total	284	100.0
When last did you get access to credit	2021	15	5.3
	2020	11	3.9
	2019 or before	31	10.9
Source of credit	Banks/Savings and Loans/Microfinance/Credit union	38	
	Relatives	17	6.0
	Colleague's poultry Farmers/friends	4	1.4
	NGOs	1	0.4
	Agro-inputs dealers	1	0.4
	Poultry out-grower	2	0.7
	No	219	77.1
	Total	284	100.0
Has your business been insured	Yes	14	4.9
	No	270	95.1
	Total	284	100.0
Aspect of business insured	Building and equipment's	8	2.8
	Birds(broilers)	2	0.7
	Saff	1	0.4
	All	4	1.4
	No	269	94.7
	Total	284	100.0

Source: Field survey, Tuoho (2022).

Appendix P

Input Supply to Broiler Producers

Variables	Categories	f	%
	Source of Feed		
Own formulation	No	127	44.7
	Yes	157	55.3
	Total	284	100.0
Local feed mills	No	93	32.7
	Yes	191	67.3
	Total	284	100.0
Imported feed	No	184	64.8
	Yes	100	35.2
	Total	283	99.6
	Total	284	100.0
Others	No	281	99.0
	Yes	3	1.0
	Total	284	100.0
	Source of Day-Old Chicks		
Local hatcheries	No	159	56.0
	Yes	125	44.0
	Total	284	100.0
Imported DOCs	No	91	32.0
	Yes	193	68.0
	Total	284	100.0
Own hatchery	No	279	98.2
	Yes	5	1.8
	Total	284	100.0
	Source of Vaccines & medications		
Government veterinary service	No	108	38.0
	Yes	176	62.0
	Total	284	100.0
Private veterinary service	No	151	53.2
	Yes	133	46.8
	Total	284	100.0
NGOs providing veterinary services	No	277	97.5
Others	Yes	7	2.5
	Total	284	100.0
	Source of equipment		
Importers of poultry production equipment	No	137	48.2
	Yes	147	51.8
	Total	284	100.0
Local producers of poultry production equipment	No	65	22.9
	Yes	219	77.1
	Total	284	100.0
Used equipment	No	275	96.8
	Yes	9	3.2
	Total	284	100.0

Source: Field survey, Tuoho (2022).

Appendix Q

Broiler Producer's Knowledge of Regulations and Regulatory Agencies

Variables	Categories	f	%
Aware of laws/regulations governing broilers	Yes	180	63.4
	No	104	36.6
	Total	284	100.0
Permit for operations by government agency or professional associations	Yes	153	53.9
	No	131	46.1
	Total	284	100.0
Is broiler farm regulated by EPA	No	235	82.7
	Yes	49	17.3
	Total	284	100.0
Is broiler farm regulated by FDA	No	249	87.7
	Yes	35	12.3
	Total	284	100.0
Is broiler farm regulated by GSA	No	269	94.7
	Yes	15	5.3
	Total	284	100.0
Is broiler farm regulated by VSD	No	158	55.6
	Yes	126	44.4
	Total	284	100.0
Is broiler farm regulated by APD	No	220	77.5
	Yes	64	22.5
	Total	284	100.0
Is broiler farm regulated by Ghana National Association of Poultry farmers	No	233	82.0
	Yes	51	18.0
	Total	284	100.0
Is broiler farm regulated by DA	No	84	29.6
	Yes	200	70.4
	Total	284	100.0
Is broiler farm regulated by EHD	No	230	81.0
	Yes	54	19.0
	Total	284	100.0
Service delivery	Poor	59	20.8
	Good	134	47.2
	Very good	84	29.6
	Excellent	7	2.5
	Total	284	100.0
Cost of service delivery	Low	75	26.0
	Moderate	141	49.6
	High	61	21.5
	Very high	7	2.5
	Total	284	100.0

Source: Field survey, Tuoho (2022).

Appendix R

Choice of Marketing Outlets for Birds and Contractual Agreement to Supply Broilers

Variable	Categories	f	%
	Form of sale of broiler birds		
Live bird			
	No	68	23.5
	Yes	221	76.5
	Total	289	100
Whole dressed chicken	No	208	72
	Yes	81	28
	Total	289	100
Chicken-cuts/ parts	No	285	98.6
	Yes	4	1.4
	Total	289	100
	Choice of marketing outlets for live birds		
Directly to consumers	No	49	17
	Yes	240	83
	Total	289	100
Retailers	No	93	32.2
	Yes	196	67.8
	Total	289	100
Wholesalers	No	176	60.9
	Yes	113	39.1
	Total	289	100
Institutions	No	257	88.9
	Yes	32	11.1
	Total	289	100
Chop bars	No	225	77.8
	Yes	64	22.2
	Total	289	100.0
Processors	No	254	87.9
	Yes	35	12.1
	Total	289	100
Hawkers	No	246	85.1
	Yes	43	14.9
	Total	289	100
Others	No	286	99
	Yes	3	1
	Total	289	100
Contractual agreement to supply broilers			
Producing under any contractual agreement	No	199	68.8
	Yes	90	31.2
	Total	289	100.0

Source: Field survey, Tuoho (2022).

Appendix S

Socio-Economic Characteristics of Broiler Producers

	n	Minimum	Maximum	Mean	Std. Deviation
Age of farm owner	262	20	80	48.15	11.747
Number of dependents	278	0	18	5.23	2.794
Number of poultry farms own	257	1	4	1.10	.392
Total bird capacity of farm per production cycle	280	100	41000	2356.14	4084.654
Number of farm workers	268	0	65	2.91	4.361
Number of male workers	270	0	57	2.17	3.751
Number of female workers	270	0	8	.62	1.055
Farm workers under 36 years of age	269	0	20	1.55	2.032
Number of farm workers in the broiler section	270	0	10	2.03	1.334
Quantity of land (site of operation)	190	.30	40.00	3.9226	5.32169
Total number of DOC used during the last production cycle	284	80	5000	644.16	705.338
Unit price of DOC used during the last production cycle	282	4.50	13.00	8.3805	1.86927
Mortality of DOC used during the last production cycle	270	.00	500.00	29.9184	54.07062
Number of birds raised for sale during the last production cycle	278	50	5000	642.21	715.038
Average mortality	262	.00	500.00	29.3096	48.04279
Number of birds sold	276	10	9970	620.90	871.274
Average price per bird GH¢	278	22.00	100.00	60.7212	12.62177

Source: Field survey, Tuoho (2022).

Appendix T
Demographic Characteristics of Live Bird Sellers

Variables	Categories	f	%
Region	Greater Accra	36	34.0
	Bono	18	17.0
	Ashanti	52	49.1
	Total	106	100.0
Sex	Male	40	37.7
	Female	66	62.3
	Total	106	100.0
Marital status	Single	21	19.8
	Married	70	66.0
	Divorced	4	3.8
	Widowed	7	6.6
	Co-habitation	4	3.8
	Total	106	100.0
Formal education	Yes	91	85.8
	No	15	14.2
	Total	106	100.0
Level of education	Basic education	53	50.0
	Secondary/ Technical or vocational	35	33.0
	Tertiary	18	17.0
	Total	106	100.0
Other occupation apart from the marketing of live birds	I do not have any other occupation	59	55.6
	Public or civil servant	5	4.7
	Private sector employee	15	14.2
	Others	27	25.5
	Total	106	100.0
Do you belong to any live bird's sellers/traders/marketers association	Yes	47	44.3
	No	59	55.6
	Total	106	100.0
Do association help you in selling live birds	Yes	38	35.8
	No	68	64.2
	Total	106	100.0
Training from association	Yes	32	30.2
	No	64	69.8
	Total	106	100.0

Source: Field survey, Tuoho (2022)

Appendix U

Access to Credit and Insurance by Live Bird Sellers

Variables	Categories	f	%
Credit access	Yes	29	27.4
	No	77	72.6
	Total	106	100.0
Last credit access	2021	11	10.4
	2020	4	3.8
	2019 or before	10	9.4
	Total	25	23.6
	No	81	76.4
	Total	106	100.0
Means of credit repayment	Cash	29	27.4
	In-kind	2	1.9
	Total	31	29.2
	No	75	70.8
	Total	106	100.0
Source of credit cash	Banks/ Savings and Loans/ Microfinance/ Credit unions	26	24.5
	Relatives	2	1.9
	Colleagues live bird seller/ friends	1	0.9
		-	-
	Total	29	27.4
	No	77	72.6
	Total	106	100.0
Have you insured the business	Yes	7	6.6
	No	99	93.4
	Total	106	100.0
Aspect of building insured	Building and equipment's	1	0.9
	Live birds for sale	5	4.7
	Total	6	5.7
	No	100	94.3
	Total	106	100.0

Source: Field survey, Tuoho (2022).

Appendix V

Marketing Channels and Types of Poultry Marketed by Live Bird Sellers

Variables	Categories	f	%
Source of live birds	Own farm	8	7.5
	Poultry farmers/producers located around	62	58.5
	Other District in this region	27	25.5
	Other regions	3	2.8
	Others	6	5.6
	Total	106	100.0
Market broilers	No	16	15.1
	Yes	90	84.9
	Total	106	100.0
Market spent layers	No	14	13.2
	Yes	92	86.8
	Total	106	100.0
Market cockerels	No	35	33.0
	Yes	71	67.0
	Total	106	100.0
Market local birds	No	58	54.7
	Yes	48	45.3
	Total	106	100.0
Market other birds	Yes	102	96.2
	No	1	0.9
	Guinea fowl	3	2.8
	Total	106	100.0

Source: Field survey, Tuoho (2022).

Appendix W

Knowledge on Regulations and Regulatory Agency by Live Bird Sellers

Variables	Categories	f	%
Do you have a permit	Yes	63	59.43
	No	43	40.57
	Total	106	100.0
Regulated by the EPA	No	98	92.5
	Yes	8	7.5
	Total	106	100.0
Regulated by FDA	No	99	93.4
	Yes	7	6.6
	Total	106	100.0
Regulated by GSA	No	102	96.23
	Yes	4	3.77
	Total	106	100.0
Regulated by VSD	No	71	67.0
	Yes	35	33.0
	Total	106	100.0
Regulated by APD	No	92	86.8
	Yes	14	13.2
	Total	105	99.1
Regulated by live bird sellers association	No	81	76.4
	Yes	25	23.6
	Total	106	100.0
Regulated by District Assembly	No	50	47.2
	Yes	56	52.8
	Total	105	99.1
Regulated by Environmental Health Department	No	84	79.2
	Yes	22	20.8
	Total	106	100.0
Service delivery	Poor	44	41.5
	Good	25	23.6
	Very Good	28	26.4
	Excellent	9	8.5
	Total	106	100.0
Cost of service delivery	Low	10	9.4
	Moderate	40	37.7
	High	7	6.6
	Very high	49	46.2
	Total	106	100.0

Source: Field survey, Tuoho (2022).

Appendix X

Socio-Economic Characteristics of Live Bird Sellers

	n	Minimum	Maximum	Mean	Std. Deviation
Age of marketing/ trade business owner	103	24	75	44.89	10.709
Total capacity (potential) or number of live birds' facility can take	102	20	6000	371.27	791.444
Current number of live birds in the facility	101	0	500	42.14	71.088
Number of markets operated in	103	1	4	1.25	.682
Total number of workers	63	0	15	2.25	2.199
Number of male workers	59	0	13	1.49	2.153
Number of female workers	56	0	3	.91	.880
Number of workers under 36 years	30	0	6	2.03	1.691
Selling price of birds (GH¢)	103	60	90	77.52	6.747
Number of birds sold per day	78	1	200	19.14	27.295

Source: Field survey, Tuoho (2022).

Appendix Y
Demographic Characteristics of Poultry Processors

Variables	Categories	f	%
Region	Ashanti	5	17.9
	Greater Accra	21	75.0
	Bono	2	7.1
	Total	28	100.0
Sex	Female	9	32.1
	Male	19	67.9
	Total	28	100.0
Marital status	Single	1	3.6
	Married	23	82.1
	Divorced	2	7.1
	Widowed	2	7.1
	Total	28	100.0
Formal Education	Yes	27	96.4
	No	1	3.6
	Total	28	100.0
Level of education	Basic education	5	18.5
	Secondary/ Technical or vocational	4	14.8
	Tertiary	18	66.7
	Total	27	100.0
Other business	I don't have any other occupation	8	28.6
	Public or Civil servant	3	10.7
	private sector employee	10	35.7
	Other	7	25.0
	Total	28	100.0
Membership of poultry processors association	Yes	11	39.3
	No	17	60.7
	Total	28	100.0
Do you get help from the association	Yes	8	28.6
	No	20	71.4
	Total	28	100.0
Any training from association in the past 3 years	Yes	9	32.1
	No	19	67.9
	Total	28	100.0
Type of ownership of site	Sole own site	15	53.6
	Family own site	6	21.4
	Rented site	3	10.7
	Own by the District assembly	3	10.7
	Other	1	3.6
	Total	28	100.0
Meat only processing line	No	6	21.4
	Yes	22	78.6
	Total	28	100.0
Egg only processing line	No	22	78.6
	Yes	6	21.4
	Total	28	100.0

Both meat and egg processing line	No	22	78.6
	Yes	6	21.4
	Total	28	100.0
Other processing line	No	28	100.0

Source: Field survey, Tuoho (2022).

Appendix Z

Access to Credit and Insurance by Poultry Processors

Variables	Categories	f	%
Access to credit	Yes	13	46.4
	No	15	53.6
	Total	28	100.0
Last time credit was accessed	2021	4	14.3
	2020	1	3.6
	2019 or before	8	28.6
	No	15	53.6
	Total	28	100.0
Source of credit	Banks/ Savings and Loans/ Microfinance/ Credit union	10	35.7
	Relatives	3	10.7
	Total	13	46.4
	No	15	53.6
	Total	28	100.0
Has your business been insured	Yes	5	17.9
	No	23	82.1
	Total	28	100
Aspect of business ensured	Building and equipment's	1	3.6
	processing of birds	2	7.1
	Total	3	10.7
	No	25	89.3
	Total	28	100.0

Source: Field survey, Tuoho (2022).

Appendix Ab

Poultry Processor's Knowledge of Regulations and Regulatory Agencies

Variables	Categories	f	%
Awareness of	Yes	17	60.7
laws/regulations	No	11	39.3
	Total	28	100.0
Do you have	Yes	17	60.7
permit	No	11	39.3
	Total	28	100.0
Regulated by EPA	No	15	53.6
	Yes	13	46.4
	Total	28	100.0
Regulated by	No	19	67.9
FDA	Yes	9	32.1
	Total	28	100.0
Regulated by	No	23	82.1
GSA	Yes	5	17.9
	Total	28	100.0
Regulated by	No	13	46.4
VSD	Yes	15	53.6
	Total	28	100.0
Regulated by	No	23	82.1
APD	Yes	5	17.9
	Total	28	100.0
Regulated by	No	27	96.4
Poultry Processors	Yes	1	3.6
Assoc.	Total	28	100.0
Regulated by DA	No	6	21.4
	Yes	22	78.6
	Total	28	100.0
Regulated by	No	20	71.4
EHD	Yes	8	28.6
	Total	28	100.0
Service delivery,	Poor	5	17.9
if you got permit	Good	19	67.9
	Very Good	3	10.7
	Excellent	1	3.6
	Total	28	100.0
Cost of service	Low	10	35.4
	Moderate	15	53.6
	High	3	10.7
	Total	28	100.0

Source: Field survey, Tuoho (2022).

Appendix Cd

Production, Marketing and Price Setting by Poultry Processors

Variables	Categories	f	%
Agreement with other businesses or persons to supply product	Yes	21	75.0
	No	7	25.0
	Total	28	100.0
What type of agreement?	Verbal/ word of mouth	14	50.0
	Written agreement	8	28.6
	No	6	21.4
	Total	28	100.0
Processing birds for a fee	Yes	18	64.3
	No	10	35.7
	Total	28	100.0
Is there a ready market for the products (dressed chicken/chicken cut)?	Yes	21	75.0
	No	7	25.0
	Total	27	96.4
	Total	28	100.0
	Total	28	100.0
Do you consider access to market before processing birds?	Yes	23	82.1
	No	5	17.9
	Total	28	100.0

Source: Field survey, Tuoho (2022).

Appendix Ef
Socio-Economic Characteristics of Poultry Processors

	n	Minimum	Maximum	Mean	Std. Deviation
Age of processing business owner	23	30	70	47.13	10.359
Number of dependents (household size)	24	2	20	6.50	4.283
Total number of workers	24	0	55	7.42	12.642
Number of male workers	23	0	34	5.04	8.210
Number of female workers	22	0	30	2.91	6.361
Number of workers under 36 years	16	0	9	3.31	2.845
Number of workers working in the poultry processing plant/ facility	24	1	55	7.33	12.534

Source: Field survey, Tuoho (2022).

Appendix H
Stochastic Profit Frontier Analysis of Broiler Producers/Farmers (Cobb-Douglas)

Variable	Coefficient	Standard Error
Intercept	5.333***	0.497
lnFeed	-0.373***	0.092
lnVaccine	0.039	0.063
lnMis	0.049	0.047
lnDOC	0.273***	0.088
lnOthers	-0.176***	0.050
Inefficiency		
Intercept	-0.3499	0.971
Age of broiler farmer	0.001	0.014
Formal education level	-0.085	0.151
Poultry farmers' association	-0.168	0.844
Sex	0.311	0.891
Family labour	0.989**	0.44
Ever access credit	-0.729**	0.312
Extension service (number of contacts)	0.363	0.547
Diagnostic statistics		
Sigma square	1.035***	
Gamma	0.985***	
Log-likelihood value	-117.81	
Mean efficiency	0.625	

Source: Field Survey, Tuoho (2022). *, **, and *** represent a significance level of 10%, 5%, and 1% respectively

Appendix I

Stochastic profit frontier analysis of Live Bird Sellers/Marketers (Cobb-Douglas)

Variable	Coefficient	Standard Error
Intercept	7.258***	1.848
lnBirds	-0.826	0.517
lnLabour	0.204	0.187
lnCOB (othercost)	-0.351	0.401
Inefficiency		
Intercept	-21.826*	13.142
Sex	0.144	1.781
Age	0.206*	0.116
Level of Education	4.394	2.926
Ever access credit	1.813	2.541
Household Size	0.135	0.156
Diagnostic statistics		
Sigma square	2.333	
Gamma	0.967***	
Log-likelihood value	-35.814	
Mean efficiency	0.589	

Source: Field Survey, Tuoho (2022). *, **, and *** represent a significance level of 10%, 5%, and 1% respectively

Appendix J
Stochastic Profit Frontier Analysis of Processors (Cobb-Douglas)

Variable	Coefficient	Standard Error
Intercept	6.8903***	0.901
lnBird	-0.9605***	0.249
lnCOB (other cost)	-0.121	0.1102
Inefficiency		
Intercept	1.7804**	0.861
Age	-0.035***	4.2271e-03
Level of Education	2.4120e-03	0.157
Processors' association	-0.3506	0.367
Ever access credit	0.323	0.2101
Household Size	0.061	0.118
Diagnostic statistics		
Sigma square	0.0802	
Gamma	1.000***	
Log-likelihood value	1.263	
Mean efficiency	0.663	

Source: Field Survey, Tuoho (2022). *, **, and *** represent a significance level of 10%, 5%, and 1% respectively

Appendix K

Perceived Knowledge Levels of Students in Broiler Value Chain Activities in Four Public Universities in Ghana

Statements	UCC		KNUST		UNER		AMMUSTED	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Inputs Production and Distribution								
Feed milling (toll feed processing)	2.23	0.60	2.16	0.72	2.49	0.69	2.17	0.84
Feed manufacturing	2.40	0.70	2.04	0.76	2.43	0.89	2.10	0.85
Importation and distribution of feed (Marketing)	2.29	0.75	2.01	0.80	2.02	0.80	2.15	0.95
Local distribution of feed (Marketing)	2.33	0.65	2.01	0.77	2.22	0.87	2.14	0.91
Feed ingredients importation and distribution (Marketing)	2.26	0.67	1.97	0.82	2.29	0.87	2.09	0.91
Local feed ingredients aggregation and distribution (Marketing)	2.11	0.80	2.08	0.77	2.20	0.72	2.24	0.93
Veterinary drugs and vaccine importation and distribution (Marketing)	2.06	0.69	1.92	0.84	2.17	0.82	2.10	1.01
Local distribution of veterinary drugs and vaccines (Marketing)	1.97	0.72	1.78	0.76	2.02	0.82	1.92	0.87
Importation and distribution of fertile hatchable eggs (Marketing)	2.03	0.80	1.85	0.80	2.39	0.83	2.05	0.92
Importation and distribution of day-old chicks	2.53	0.83	2.24	0.83	2.51	1.00	2.33	0.99
Hatching and distribution of day-old chicks locally	2.26	0.83	2.22	0.84	2.40	1.03	2.17	0.97
Operating a broiler parent stock/holding farm to produce locally fertile hatchable eggs	2.18	0.88	2.01	0.80	2.09	0.80	2.00	0.90
Index	**2.22**	**0.74**	**2.02**	**0.79**	**2.27**	**0.84**	**2.12**	**0.92**
Broiler Production Activities								
Brooding of broiler from week zero (0) to week four (4)	2.15	0.86	2.27	0.82	2.22	0.73	2.29	0.93
Raising broiler from week four (4) to week eight (8)	2.29	0.76	2.29	0.84	2.39	0.88	2.47	0.92
Raising broiler from week zero (0) to week eight (8)	2.24	0.83	2.28	0.85	2.47	0.84	2.45	0.97

Index	**2.23**	**0.82**	**2.28**	**0.84**	**2.36**	**0.82**	**2.40**	**0.94**
Broiler Processing Activities								
Whole dressing of birds	2.62	0.85	2.37	1.84	2.31	0.95	2.25	1.00
Dressing and cutting of birds into chicken parts	2.53	0.99	2.39	0.93	2.43	0.97	2.37	1.04
Index	**2.58**	**0.92**	**2.38**	**1.38**	**2.37**	**0.96**	**2.31**	**1.02**
Marketing of broiler Activities								
Live birds selling	2.79	0.99	2.37	0.92	2.77	0.89	2.68	0.95
Dressed whole or chicken cuts for sale (operating a cold store for locally produced broilers)	2.64	0.93	2.29	0.97	2.55	1.00	2.21	1.02
Index	**2.72**	**0.96**	**2.33**	**0.94**	**2.66**	**0.94**	**2.45**	**0.99**
Waste management Activities								
Converting broiler dropping into manure	2.38	0.89	2.32	1.01	2.57	1.11	2.44	1.11
Using broiler dropping to generate energy	1.76	0.86	1.62	0.87	1.60	0.85	1.56	0.94
Converting furthers and visceral from broiler processing to feed for other animals	1.71	0.76	1.64	0.81	1.87	0.90	1.62	0.88
Index	**1.95**	**0.83**	**1.86**	**0.90**	**2.01**	**0.95**	**1.87**	**0.98**
Provision of Support services								
Construction of poultry houses	2.18	0.85	2.26	0.91	2.70	0.86	2.43	0.94
Local production/fabrication of lighting systems, egg, drinkers, feeders, etc.)	2.06	0.78	2.26	0.88	2.72	0.86	2.38	1.00
Importation and distribution of lighting systems, egg, drinkers, feeders, etc.)	1.91	0.75	1.82	0.82	2.34	1.01	1.98	0.93
Distribution of locally produced/fabricated, lighting systems, drinkers, feeders, etc.)	1.82	0.76	1.89	0.78	2.32	0.86	1.95	0.90
Communication-advertising of broiler production inputs and products	2.09	0.71	1.93	0.84	2.39	1.02	2.01	0.91

Provision of business development services to broiler value chain actors	2.24	0.82	1.89	0.86	2.28	0.96	1.93	0.89
Provision of animal husbandry and nutritional services (training & advisory)	2.26	0.71	2.03	0.86	2.13	0.82	2.08	0.98
Transportation of production inputs and products of the broiler value chain	2.24	0.86	2.03	0.88	2.34	0.84	2.07	0.91
Index	**2.10**	**0.78**	**2.01**	**0.85**	**2.40**	**0.90**	**2.10**	**0.93**
Overall index	**2.30**	**0.84**	**2.15**	**0.95**	**2.35**	**0.90**	**2.21**	**0.96**

Source: Field Survey, Tuoho (2022). *1 = Poor, 2 = Good, 3 = Very Good and 4 = Excellent.

Appendix L

Perceived Knowledge Levels of Students in Broiler Value Chain Activities Pursuing Different Agricultural Programs in Four Public Universities in Ghana

Statements	Agribusiness		Agric Extension		Agric Economics		Animal Science		Crop Science		Biotech		Agro-Processing	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Inputs Production and Distribution														
Feed milling (toll feed processing)	2.26	0.71	2.13	0.95	1.93	0.73	2.21	0.78	2.19	0.71	2.13	0.78	2.50	0.55
Feed manufacturing	2.21	0.76	1.78	0.82	2.00	0.56	2.06	0.81	2.16	0.84	2.03	0.77	2.67	0.82
Importation and distribution of feed (Marketing)	2.21	0.79	1.88	0.89	1.88	0.82	1.97	0.89	2.09	0.86	2.05	0.73	2.50	1.05
Local distribution of feed (Marketing)	2.16	0.71	1.92	0.87	1.80	0.65	2.06	0.79	2.13	0.89	2.03	0.91	2.50	0.84
Feed ingredients importation and distribution (Marketing)	2.24	0.84	1.86	0.96	1.80	0.72	2.08	0.84	1.98	0.84	2.00	0.84	2.17	0.98
Local feed ingredients aggregation and distribution (Marketing)	2.15	0.78	1.92	0.88	2.00	0.66	2.17	0.81	2.21	0.87	1.94	0.75	2.17	0.75
Veterinary drugs and vaccine importation and distribution (Marketing)	1.98	0.80	1.88	0.96	2.10	0.81	1.98	0.96	2.06	0.92	1.73	0.84	2.00	1.00
Local distribution of veterinary drugs and vaccines (Marketing)	1.79	0.70	1.83	0.86	1.93	0.80	1.83	0.88	1.93	0.82	1.57	0.60	2.00	1.00
Importation and distribution of fertile hatchable eggs (Marketing)	1.97	0.80	1.87	0.84	1.88	0.85	2.01	0.93	2.00	0.85	1.72	0.82	2.00	1.00
Importation and distribution of day-old	2.37	0.90	2.29	0.90	2.46	0.82	2.24	0.94	2.29	0.89	2.03	0.73	3.00	1.23

chicks														
Hatching and distribution of day-old chicks locally	2.23	0.84	2.10	0.88	2.51	0.85	2.13	0.88	2.22	0.96	2.26	0.78	2.60	1.14
Operating a broiler parent stock/holding farm to produce locally fertile hatcherable eggs	2.05	0.81	1.85	0.85	1.98	0.77	1.95	0.84	2.06	0.86	2.14	0.79	2.20	1.30
Index	**2.14**	**0.79**	**1.94**	**0.89**	**2.02**	**0.75**	**2.06**	**0.86**	**2.11**	**0.86**	**1.97**	**0.78**	**2.36**	**0.97**
Broiler Production Activities														
Brooding of broiler from week zero (0) to week four (4)	2.25	0.82	2.16	0.93	2.30	0.76	2.46	0.88	2.23	0.84	2.05	0.85	1.80	0.84
Raising broiler from week four (4) to week eight (8)	2.35	0.84	2.20	0.92	2.38	0.84	2.55	0.89	2.32	0.86	2.16	0.90	2.20	0.45
Raising broiler from week zero (0) to week eight (8)	2.28	0.86	2.10	0.90	2.38	0.84	2.55	0.86	2.36	0.90	2.14	0.95	2.00	1.00
Index	**2.29**	**0.84**	**2.15**	**0.91**	**2.35**	**0.81**	**2.52**	**0.87**	**2.30**	**0.87**	**2.12**	**0.90**	**2.00**	**0.76**
Broiler Processing Activities														
Whole dressing of birds	2.28	0.93	2.32	1.04	2.20	0.97	2.38	1.01	2.39	2.20	2.24	0.86	3.40	0.55
Dressing and cutting of birds into chicken parts	2.32	0.97	2.42	1.07	2.42	0.90	2.40	1.00	2.39	0.95	2.50	0.85	3.60	0.55
Index	**2.30**	**0.95**	**2.37**	**1.06**	**2.31**	**0.93**	**2.39**	**1.00**	**2.39**	**1.57**	**2.37**	**0.85**	**3.50**	**0.55**
Marketing of broiler Activities														
Live birds selling	2.56	0.97	2.54	0.99	2.30	0.99	2.61	0.94	2.50	0.89	2.27	1.02	2.25	0.96
Dressed whole or chicken cuts for sale (operating a cold store for locally produced broilers)	2.38	0.96	2.30	1.07	2.33	1.16	2.35	1.01	2.21	0.95	2.22	1.03	3.20	0.45
Index	**2.47**	**0.96**	**2.42**	**1.03**	**2.32**	**1.08**	**2.48**	**0.97**	**2.36**	**0.92**	**2.25**	**1.02**	**2.73**	**0.70**
Waste management Activities														
Converting broiler dropping into manure	2.31	0.98	2.53	1.05	2.33	1.00	2.29	1.07	2.47	1.06	2.19	1.14	2.20	1.30
Using broiler dropping to generate energy	1.65	0.88	1.45	0.88	1.58	0.93	1.50	0.80	1.67	0.92	1.62	0.92	1.80	1.10

Converting furthers and visceral from broiler processing to feed for other animals	1.65	0.81	1.53	0.70	1.83	1.01	1.55	0.78	1.75	0.89	1.43	0.70	1.60	0.89
Index	**1.87**	**0.89**	**1.84**	**0.88**	**1.91**	**0.98**	**1.78**	**0.88**	**1.96**	**0.96**	**1.75**	**0.92**	**1.87**	**1.10**
Provision of Support services														
Construction of poultry houses	2.37	0.92	2.47	1.01	2.25	0.98	2.38	0.85	2.31	0.90	2.08	1.01	2.60	1.14
Local production/fabrication of lighting systems, egg, drinkers, feeders, etc.)	2.37	0.92	2.42	0.98	2.33	0.92	2.33	0.92	2.29	0.91	2.16	0.96	1.80	0.84
Importation and distribution of lighting systems, egg, drinkers, feeders, etc.)	1.99	0.94	1.81	0.91	1.83	0.90	1.90	0.77	1.94	0.88	1.65	0.75	2.00	0.71
Distribution of locally produced/fabricated, lighting systems, drinkers, feeders, etc.)	2.04	0.82	1.88	0.88	1.93	0.86	1.87	0.80	1.95	0.83	1.65	0.75	2.40	0.89
Communication-advertising of broiler production inputs and products	2.12	0.88	1.88	0.78	1.98	0.92	1.86	0.83	2.06	0.91	1.73	0.87	2.00	0.71
Provision of business development services to broiler value chain actors	2.14	0.94	1.92	0.90	1.75	0.81	1.83	0.86	1.96	0.86	1.56	0.74	2.80	0.45
Provision of animal husbandry and nutritional services (training & advisory)	2.10	0.88	2.06	0.83	1.93	0.69	2.02	0.88	2.14	0.94	1.73	0.87	2.40	0.55
Transportation of production inputs and products of the broiler value chain	2.27	0.89	2.10	0.90	2.03	0.92	1.99	0.82	2.05	0.90	1.73	0.80	2.40	0.55
Index	**2.18**	**0.90**	**2.07**	**0.90**	**2.00**	**0.88**	**2.02**	**0.84**	**2.09**	**0.89**	**1.79**	**0.84**	**2.30**	**0.73**
Overall index	**2.21**	**0.89**	**2.13**	**0.94**	**2.15**	**0.91**	**2.21**	**0.90**	**2.20**	**1.01**	**2.04**	**0.89**	**2.46**	**0.80**

Source: Field Survey, Tuoho (2022) *1 = Poor, 2 = Good, 3 = Very Good and 4 = Excellent.

Appendix M

Lsd Post Hoc Test Results on Perceived Knowledge in Marketing of Broiler Activities

(I) University	(J) University	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
University of Cape Coast	Kwame Nkrumah University of Science and Technology	.37962*	.15066	.012	.0838	.6755
	University of Energy and Natural Resources	.04631	.18943	.807	-.3257	.4183
	AAMUSTED	.25588	.15608	.102	-.0506	.5624
Kwame Nkrumah University of Science and Technology	University of Cape Coast	-.37962*	.15066	.012	-.6755	-.0838
	University of Energy and Natural Resources	-.33331*	.13015	.011	-.5889	-.0777
	AAMUSTED	-.12374	.07360	.093	-.2683	.0208
University of Energy and Natural Resources	University of Cape Coast	-.04631	.18943	.807	-.4183	.3257
	Kwame Nkrumah University of Science and Technology	.33331*	.13015	.011	.0777	.5889
	AAMUSTED	.20957	.13639	.125	-.0582	.4774
AAMUSTED	University of Cape Coast	-.25588	.15608	.102	-.5624	.0506
	Kwame Nkrumah University of Science and Technology	.12374	.07360	.093	-.0208	.2683
	University of Energy and Natural Resources	-.20957	.13639	.125	-.4774	.0582

Source: Field Survey, Tuoho (2022). *. The mean difference is significant at the 0.05 level.

Appendix N

Tukey Hsd Post Hoc Test Results on Perceived Knowledge in Provision of Support Services

(I) University	(J) University	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
University of Cape Coast	Kwame Nkrumah University of Science and Technology	.09048	.11712	.867	-.2112	.3921
	University of Energy and Natural Resources	-.29570	.14728	.186	-.6750	.0836
	AAMUSTED	-.00414	.12139	1.000	-.3168	.3085
Kwame Nkrumah University of Science and Technology	University of Cape Coast	-.09048	.11712	.867	-.3921	.2112
	University of Energy and Natural Resources	-.38619*	.10118	.001	-.6468	-.1256
	AAMUSTED	-.09462	.05729	.351	-.2422	.0529
University of Energy and Natural Resources	University of Cape Coast	.29570	.14728	.186	-.0836	.6750
	Kwame Nkrumah University of Science and Technology	.38619*	.10118	.001	.1256	.6468
	AAMUSTED	.29157*	.10609	.031	.0183	.5648
AAMUSTED	University of Cape Coast	.00414	.12139	1.000	-.3085	.3168
	Kwame Nkrumah University of Science and Technology	.09462	.05729	.351	-.0529	.2422
	University of Energy and Natural Resources	-.29157*	.10609	.031	-.5648	-.0183

Source: Field Survey, Tuoho (2022). *. The mean difference is significant at the 0.05 level.

Appendix O

Tamhane Post Hoc Test Results on Perceived Knowledge in Inputs Production and Distribution Activities

	(I) University	(J) University	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Tamhane	University of Cape Coast	Kwame Nkrumah University of Science and Technology	.19962	.07515	.064	-.0075	.4067
		University of Energy and Natural Resources	-.04966	.09976	.997	-.3189	.2196
		AAMUSTED	.09854	.08348	.811	-.1280	.3251
	Kwame Nkrumah University of Science and Technology	University of Cape Coast	-.19962	.07515	.064	-.4067	.0075
		University of Energy and Natural Resources	-.24928*	.07502	.009	-.4535	-.0451
		AAMUSTED	-.10109	.05142	.266	-.2372	.0350
	University of Energy and Natural Resources	University of Cape Coast	.04966	.09976	.997	-.2196	.3189
		Kwame Nkrumah University of Science and Technology	.24928*	.07502	.009	.0451	.4535
		AAMUSTED	.14820	.08336	.389	-.0762	.3726
	AAMUSTED	University of Cape Coast	-.09854	.08348	.811	-.3251	.1280
		Kwame Nkrumah University of Science and Technology	.10109	.05142	.266	-.0350	.2372
		University of Energy and Natural Resources	-.14820	.08336	.389	-.3726	.0762

Source: Field Survey, Tuoho (2022). *. The mean difference is significant at the 0.05 level.

Appendix P
Lsd Post Hoc Test Results on Perceived Knowledge in Broiler Production Activities

(I) Program	(J) Program	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Agricbsiness	Agric Extension	.14241	.12587	.258	-.1048	.3896
	Agric Economics	-.05726	.13830	.679	-.3288	.2143
	Animal Science	-.23089*	.09326	.014	-.4140	-.0478
	Crop Science	-.00852	.08032	.916	-.1662	.1492
	Agric Biotech	.17562	.14269	.219	-.1046	.4558
	Agroprocessing	.29274	.35453	.409	-.4034	.9889
Agric Extension	Agricbusiness	-.14241	.12587	.258	-.3896	.1048
	Agric Economics	-.19967	.16481	.226	-.5233	.1240
	Animal Science	-.37330*	.12936	.004	-.6273	-.1193
	Crop Science	-.15093	.12036	.210	-.3873	.0854
	Agric Biotech	.03321	.16852	.844	-.2977	.3641
	Agroprocessing	.15033	.36569	.681	-.5677	.8684
Agric Economics	Agribusiness	.05726	.13830	.679	-.2143	.3288
	Agric Extension	.19967	.16481	.226	-.1240	.5233
	Animal Science	-.17362	.14149	.220	-.4514	.1042
	Crop Science	.04874	.13331	.715	-.2130	.3105
	Agric Biotech	.23288	.17799	.191	-.1166	.5824
	Agro processing	.35000	.37015	.345	-.3768	1.0768
Animal Science	Agribusiness	.23089*	.09326	.014	.0478	.4140
	Agric Extension	.37330*	.12936	.004	.1193	.6273
	Agric Economics	.17362	.14149	.220	-.1042	.4514
	Crop Science	.22237*	.08569	.010	.0541	.3906
	Agric Biotech	.40650*	.14578	.005	.1202	.6928
	Agro processing	.52362	.35578	.142	-.1750	1.2222
Crop Science	Agribusiness	.00852	.08032	.916	-.1492	.1662
	Agric Extension	.15093	.12036	.210	-.0854	.3873
	Agric Economics	-.04874	.13331	.715	-.3105	.2130
	Animal Science	-.22237*	.08569	.010	-.3906	-.0541
	Agric Biotech	.18414	.13786	.182	-.0866	.4548
	Agro processing	.30126	.35261	.393	-.3911	.9937
Agric Biotech	Agribusiness	-.17562	.14269	.219	-.4558	.1046
	Agric Extension	-.03321	.16852	.844	-.3641	.2977
	Agric Economics	-.23288	.17799	.191	-.5824	.1166
	Animal Science	-.40650*	.14578	.005	-.6928	-.1202
	Crop Science	-.18414	.13786	.182	-.4548	.0866
	Agro processing	.11712	.37181	.753	-.6130	.8472

Agro processing	Agribusiness	-.29274	.35453	.409	-.9889	.4034
	Agric Extension	-.15033	.36569	.681	-.8684	.5677
	Agric Economics	-.35000	.37015	.345	-1.0768	.3768
	Animal Science	-.52362	.35578	.142	-1.2222	.1750
	Crop Science	-.30126	.35261	.393	-.9937	.3911
	Agric Biotech	-.11712	.37181	.753	-.8472	.6130

Source: Field Survey, Tuoho (2022). *. The mean difference is significant at the 0.05 level.

Appendix Q

Perception of Students Towards Engaging in Broiler Value Chain Activities in Four Public Universities in Ghana

	UCC		KNUST		UNER		AMMUSTED	
Statements	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**
Socio-cultural Perceptions								
My parents told me not to be involved in any farming or agriculture related activities	1.59	1.06	1.56	0.99	1.89	1.17	1.53	1.03
Broiler value chain businesses are not respected	2.43	0.85	2.48	1.01	2.43	0.90	2.10	1.01
Broiler value chain jobs are dirty to do	2.43	1.32	2.51	1.20	2.36	1.22	2.26	1.22
Broiler value chain jobs are for older people	1.59	0.87	1.80	0.98	2.17	1.34	1.65	1.06
Broiler businesses are for poor people	1.45	0.79	1.55	0.88	1.81	1.12	1.51	0.93
Broiler production is job for males	1.68	1.01	1.84	0.98	1.85	0.98	1.83	1.02
Feed milling jobs is jobs for males	1.75	0.87	2.07	1.15	2.45	1.21	2.03	1.16
Females are supposed to carry out poultry processing in the broiler value chain	2.48	1.17	2.16	1.15	2.45	1.19	2.29	1.24
Females are supposed to carry out marketing activities in the broiler value chai	2.66	1.29	2.37	1.22	2.66	1.29	2.54	1.37
Broiler value chain jobs are difficult or more demanding	3.09	1.16	3.41	1.05	3.23	1.01	3.38	1.21
Broiler farming makes you poor	1.55	0.79	1.73	0.98	1.64	0.99	1.61	0.99
Farmers work hard for little reward	3.00	1.29	3.15	1.28	2.96	1.18	2.92	1.46
Broiler production is for school dropouts and illiterates	1.39	0.78	1.50	0.88	1.62	1.03	1.55	1.03
Broiler production is for the less privileged in the society	1.39	0.72	1.61	0.94	1.74	0.99	1.73	1.05
Index	**2.03**	**1.00**	**2.12**	**1.05**	**2.23**	**1.12**	**2.07**	**1.13**
Economic Perceptions								
Broiler value chain businesses are not profitable	1.70	0.93	1.93	0.99	1.87	1.12	1.74	1.04
Broiler value chain business is a high risk one due to disease out breaks	3.05	1.26	3.55	1.13	3.26	1.19	3.73	1.15
The depreciation of the Ghana cedis may increase cost of production and rendering	3.66	1.06	3.87	1.05	3.60	1.10	3.91	1.15

Broiler value chain jobs are not well paying	2.43	1.13	2.78	1.06	2.79	1.16	2.66	1.18
Broiler value chain businesses are capital intensive, because of this young people	3.43	1.27	3.73	1.15	3.30	1.28	3.66	1.18
High feed cost would affect the business turn over (profitability)	3.82	1.11	4.03	0.99	3.45	1.19	3.97	1.19
Whole scale importation of poultry production inputs makes broiler value chain b	3.59	1.25	3.80	1.00	3.53	1.12	3.70	1.14
Index	**3.10**	**1.14**	**3.38**	**1.05**	**3.11**	**1.17**	**3.34**	**1.14**
Government policy perceptions								
Government has a no consistent poultry production policy	3.48	1.21	3.56	1.07	3.62	1.13	3.65	1.28
There is no sufficient extension support to poultry producers	3.11	1.08	3.21	1.18	3.26	1.28	3.30	1.30
There is little or no use of technology and machines in broiler production in Ghana	2.82	1.08	3.41	1.18	3.09	1.37	3.29	1.35
The poultry industry is not a priority to Government of Ghana	3.14	1.31	3.41	1.12	3.19	1.14	3.30	1.28
Ghana government has no import substitution policy to reduce and eliminate important	3.25	1.28	3.65	1.10	3.23	1.24	3.63	1.26
Local broiler businesses are not given subsidies to lower their cost of production	3.50	1.23	3.70	1.04	3.64	0.94	3.83	1.15
University education does not adequately prepare first degree holders to start their own business	3.00	1.26	3.52	1.32	3.15	1.30	3.43	1.40
Index	**3.19**	**1.21**	**3.49**	**1.14**	**3.31**	**1.20**	**3.49**	**1.29**
Resource availability								
It is not easy for young people to access credit to start or scale-up broiler pr	3.68	1.29	3.70	1.28	3.40	1.23	3.69	1.38
Young people do not have easy access to get land for broiler value chain activities	3.82	1.17	3.93	1.13	3.49	1.12	3.65	1.23
Information needed to support broiler value Chain activities are not easily ava	3.00	1.12	3.34	1.18	2.94	1.11	3.38	1.24
Production inputs are not readily available	3.48	1.05	3.61	1.10	3.32	0.89	3.54	1.23
It is not easy to sell broiler meat and meat products in Ghana	2.66	1.08	2.90	1.12	2.79	1.06	2.71	1.26
It is not easy to sell live Broiler in Ghana	2.55	1.02	2.70	1.05	2.60	0.95	2.51	1.16
There are no broiler processing plants/ factories in my region	2.34	1.10	2.55	1.26	2.81	1.38	2.12	1.38
Index	**3.08**	**1.12**	**3.25**	**1.16**	**3.05**	**1.10**	**3.09**	**1.27**
Overall Index	**2.85**	**1.12**	**3.06**	**1.10**	**2.93**	**1.15**	**3.00**	**1.21**

Source: Field Survey (2022). *1 = Strongly disagree, 2 = Disagree, 3 = Neutral, 4 = Agree and 5 = Strongly agree

Appendix R

Perception of Students Pursuing Different Agricultural Programs in Four Public Universities in Ghana Towards Engaging in Broiler Value Chain Activities

Statements	Agribusiness		Agric Extension		Agric Economics		Animal Science		Crop Science		Biotech		Agro-Processing	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Socio-cultural Perceptions														
My parents told me not to be involved in any farming or agriculture related activities	1.87	1.19	1.38	0.84	1.45	0.78	1.47	0.87	1.55	1.03	1.51	1.06	1.23	0.60
Broiler value chain businesses are not respected	2.50	0.95	2.32	0.87	2.70	1.11	2.23	1.07	2.29	1.01	2.45	0.98	2.31	1.03
Broiler value chain jobs are dirty to do	2.59	1.24	2.26	1.18	2.30	1.09	2.26	1.16	2.45	1.22	2.46	1.26	2.46	1.45
Broiler value chain jobs are for older people	1.92	1.18	1.66	0.98	1.65	0.80	1.61	0.96	1.82	1.03	1.76	1.00	1.23	0.44
Broiler businesses are for poor people	1.67	1.01	1.45	0.89	1.43	0.71	1.34	0.78	1.64	0.91	1.59	0.98	1.15	0.56
Broiler production is job for males	1.82	0.98	1.79	1.10	1.53	0.72	1.72	0.95	1.91	0.99	1.96	1.06	1.54	1.20
Feed milling jobs is jobs for males	2.14	1.14	2.11	1.22	1.75	0.90	1.89	1.02	2.22	1.21	1.96	1.19	1.38	0.65
Females are supposed to carry out poultry processing in the broiler value chain	2.18	1.15	2.11	1.12	1.73	0.75	2.24	1.18	2.36	1.25	2.19	1.18	2.46	1.20
Females are supposed to carry out marketing activities in the broiler value chai	2.44	1.26	2.49	1.31	2.05	1.06	2.27	1.22	2.61	1.30	2.48	1.34	2.54	1.27
Broiler value chain jobs are difficult or more demanding	3.37	0.97	3.40	1.25	3.45	1.13	3.37	1.15	3.38	1.08	3.31	1.19	3.15	1.46
Broiler farming makes you poor	1.71	0.97	1.68	1.09	1.70	1.02	1.51	0.82	1.74	1.04	1.76	0.96	1.15	0.38
Farmers work hard for little reward	3.17	1.22	3.32	1.41	3.20	1.34	2.77	1.30	3.07	1.35	3.08	1.39	2.85	1.52
Broiler production is for school dropouts and illiterates	1.57	1.04	1.43	0.82	1.43	0.64	1.34	0.80	1.61	1.00	1.59	0.92	1.00	0.00

Broiler production is for the less privileged in the society	1.64	0.97	1.64	1.02	1.45	0.71	1.52	0.86	1.75	1.04	1.68	0.95	1.00	0.00
Index	**2.19**	**1.09**	**2.07**	**1.08**	**1.99**	**0.91**	**1.97**	**1.01**	**2.17**	**1.10**	**2.13**	**1.10**	**1.82**	**0.84**
Economic Perceptions														
Broiler value chain businesses are not profitable	1.90	1.01	1.96	1.19	1.93	1.07	1.66	0.90	1.89	1.01	1.96	1.07	1.54	0.78
Broiler value chain business is a high risk one due to disease out breaks	3.49	1.16	3.64	1.15	3.70	1.02	3.44	1.26	3.70	1.11	3.31	1.06	3.23	1.74
The depreciation of the Ghana cedis may increase cost of production and rendering	3.76	1.03	3.94	0.91	4.08	1.00	3.79	1.16	3.88	1.10	3.89	1.16	3.85	1.28
Broiler value chain jobs are not well paying	2.72	1.02	2.62	1.18	2.70	1.14	2.53	1.12	2.81	1.13	2.91	1.06	2.46	1.20
Broiler value chain businesses are capital intensive, because of this young people	3.56	1.19	3.55	1.10	3.65	1.23	3.79	1.16	3.67	1.15	3.83	1.19	3.08	1.71
High feed cost would affect the business turn over (profitability)	4.02	1.02	4.21	0.99	4.22	0.77	4.06	1.07	3.81	1.16	3.91	1.06	3.85	1.28
Whole scale importation of poultry production inputs makes broiler value chain	3.81	0.98	3.79	1.17	3.93	0.94	3.77	1.05	3.65	1.11	3.79	1.03	3.38	1.39
Index	**3.32**	**1.06**	**3.39**	**1.10**	**3.46**	**1.02**	**3.29**	**1.10**	**3.34**	**1.11**	**3.37**	**1.09**	**3.06**	**1.34**
Government policy perceptions														
Government has a no consistent poultry production policy	3.55	1.03	3.70	1.14	3.50	1.04	3.73	1.22	3.57	1.19	3.44	1.11	3.54	1.39
There is no sufficient extension support to poultry producers	3.27	1.16	3.04	1.37	3.35	1.08	3.37	1.21	3.16	1.26	3.25	1.15	3.00	1.23
There is little or no use of technology and machines in broiler production in Ghana	3.28	1.13	3.26	1.30	3.55	1.18	3.33	1.27	3.30	1.33	3.45	1.16	2.69	1.03
The poultry industry is not a priority to Government of Ghana	3.29	1.05	3.36	1.36	3.38	1.19	3.32	1.21	3.36	1.21	3.50	1.15	3.15	1.46
Ghana government has no import substitution policy to reduce and eliminate important	3.59	1.11	3.55	1.34	3.50	1.11	3.51	1.22	3.57	1.19	3.85	1.07	3.69	1.25
Local broiler businesses are not given subsidies to lower their cost of production	3.76	1.03	3.81	1.00	3.73	1.09	3.78	1.09	3.69	1.09	3.58	1.16	3.92	1.19
University education does not adequately prepare first degree holders to start their own business	3.44	1.34	3.49	1.45	3.68	1.27	3.38	1.37	3.39	1.34	3.51	1.29	3.38	1.39
Index	**3.45**	**1.12**	**3.46**	**1.28**	**3.53**	**1.14**	**3.49**	**1.23**	**3.43**	**1.23**	**3.51**	**1.16**	**3.34**	**1.28**

Resource availability														
It is not easy for young people to access credit to start or scale-up broiler production	3.83	1.18	3.57	1.38	4.00	1.16	3.88	1.24	3.54	1.35	3.39	1.43	3.85	1.46
Young people do not have easy access to get land for broiler value chain activities	4.01	1.03	3.74	1.30	4.05	0.93	3.93	1.05	3.61	1.23	3.79	1.26	3.85	1.46
Information needed to support broiler value Chain activities are not easily ava	3.26	1.13	3.49	1.34	3.33	1.21	3.34	1.18	3.23	1.20	3.48	1.19	3.08	1.38
Production inputs are not readily available	3.53	1.10	3.47	1.22	3.85	1.00	3.61	1.12	3.49	1.16	3.66	1.10	3.69	0.95
It is not easy to sell broiler meat and meat products in Ghana	2.85	1.00	2.85	1.35	2.98	1.25	2.63	1.13	2.87	1.19	2.91	1.17	2.15	0.99
It is not easy to sell live Broiler in Ghana	2.65	0.97	2.68	1.33	2.53	1.13	2.44	1.11	2.72	1.05	2.74	1.06	2.00	0.71
There are no broiler processing plants/ factories in my region	2.59	1.20	2.38	1.32	1.90	1.03	2.21	1.29	2.52	1.37	2.49	1.41	2.38	1.26
Index	**3.25**	**1.09**	**3.17**	**1.32**	**3.23**	**1.10**	**3.15**	**1.16**	**3.14**	**1.22**	**3.21**	**1.23**	**3.00**	**1.17**
Overall Index	**2.44**	**0.87**	**2.42**	**0.95**	**2.44**	**0.83**	**2.38**	**0.90**	**2.42**	**0.93**	**2.44**	**0.92**	**2.24**	**0.93**

Source: Field Survey (2022). *1 = Strongly disagree, 2 = Disagree, 3 = Neutral, 4 = Agree and 5 = Strongly agree

Appendix S

Tukey HSD Post Hoc Test Results on Economic Perception and Government Policy Perception

Multiple Comparisons

Tukey HSD

Dependent Variable	(I) University	(J) University	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Economic Perceptions	University of Cape Coast	Kwame Nkrumah University of Science and Technology	-.28888*	.10222	.025	-.5521	-.0257
		University of Energy and Natural Resources	-.01506	.13546	1.000	-.3639	.3338
		AAMUSTED	-.24188	.10715	.109	-.5178	.0340
	Kwame Nkrumah University of Science and Technology	University of Cape Coast	.28888*	.10222	.025	.0257	.5521
		University of Energy and Natural Resources	.27382*	.09922	.030	.0183	.5293
		AAMUSTED	.04699	.05456	.825	-.0935	.1875
	University of Energy and Natural Resources	University of Cape Coast	.01506	.13546	1.000	-.3338	.3639
		Kwame Nkrumah University of Science and Technology	-.27382*	.09922	.030	-.5293	-.0183
		AAMUSTED	-.22682	.10429	.131	-.4954	.0417
	AAMUSTED	University of Cape Coast	.24188	.10715	.109	-.0340	.5178
		Kwame Nkrumah University of Science and Technology	-.04699	.05456	.825	-.1875	.0935
		University of Energy and Natural Resources	.22682	.10429	.131	-.0417	.4954
Government policy perceptions	University of Cape Coast	Kwame Nkrumah University of Science and Technology	-.30778*	.11243	.032	-.5973	-.0183
		University of Energy and Natural Resources	-.12497	.14899	.836	-.5086	.2587
		AAMUSTED	-.30532*	.11786	.048	-.6088	-.0018
	Kwame Nkrumah University of Science and Technology	University of Cape Coast	.30778*	.11243	.032	.0183	.5973
		University of Energy and Natural Resources	.18281	.10913	.338	-.0982	.4638
		AAMUSTED	.00246	.06001	1.000	-.1521	.1570
	University of Energy and Natural Resources	University of Cape Coast	.12497	.14899	.836	-.2587	.5086
		Kwame Nkrumah University of Science and Technology	-.18281	.10913	.338	-.4638	.0982
		AAMUSTED	-.18035	.11471	.395	-.4757	.1150
	AAMUSTED	University of Cape Coast	.30532*	.11786	.048	.0018	.6088
		Kwame Nkrumah University of Science and Technology	-.00246	.06001	1.000	-.1570	.1521
		University of Energy and Natural Resources	.18035	.11471	.395	-.1150	.4757

*. The mean difference is significant at the 0.05 level.

Source: Field Survey, Tuoho (2022).

Appendix T

Tamhane Post Hoc Test Results on Socio-Cultural Perception

(I) Program	(J) Program	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Agricbsiness	Agric Extension	.11079	.09781	.998	-.1937	.4153
	Agric Economics	.20054	.09139	.485	-.0854	.4865
	Animal Science	.21952*	.06860	.032	.0097	.4293
	Crop Science	.01432	.06459	1.000	-.1830	.2117
	Agric Biotech	.05947	.08863	1.000	-.2134	.3324
	Agroprocessing	.36758	.13822	.302	-.1275	.8626
Agric Extension	Agricbsiness	-.11079	.09781	.998	-.4153	.1937
	Agric Economics	.08976	.11178	1.000	-.2588	.4383
	Animal Science	.10873	.09407	.998	-.1853	.4027
	Crop Science	-.09647	.09118	.999	-.3824	.1895
	Agric Biotech	-.05131	.10953	1.000	-.3907	.2881
	Agroprocessing	.25679	.15247	.904	-.2616	.7751
Agric Economics	Agricbsiness	-.20054	.09139	.485	-.4865	.0854
	Agric Extension	-.08976	.11178	1.000	-.4383	.2588
	Animal Science	.01897	.08737	1.000	-.2560	.2939
	Crop Science	-.18622	.08425	.482	-.4526	.0802
	Agric Biotech	-.14107	.10384	.983	-.4639	.1817
	Agroprocessing	.16703	.14843	.999	-.3443	.6783
Animal Science	Agricbsiness	-.21952*	.06860	.032	-.4293	-.0097
	Agric Extension	-.10873	.09407	.998	-.4027	.1853
	Agric Economics	-.01897	.08737	1.000	-.2939	.2560
	Crop Science	-.20520*	.05876	.011	-.3848	-.0256
	Agric Biotech	-.16005	.08447	.729	-.4208	.1007
	Agroprocessing	.14806	.13560	.999	-.3445	.6406
Crop Science	Agricbsiness	-.01432	.06459	1.000	-.2117	.1830
	Agric Extension	.09647	.09118	.999	-.1895	.3824
	Agric Economics	.18622	.08425	.482	-.0802	.4526
	Animal Science	.20520*	.05876	.011	.0256	.3848
	Agric Biotech	.04515	.08125	1.000	-.2061	.2964
	Agroprocessing	.35326	.13361	.332	-.1377	.8442
Agric Biotech	Agricbsiness	-.05947	.08863	1.000	-.3324	.2134
	Agric Extension	.05131	.10953	1.000	-.2881	.3907
	Agric Economics	.14107	.10384	.983	-.1817	.4639
	Animal Science	.16005	.08447	.729	-.1007	.4208
	Crop Science	-.04515	.08125	1.000	-.2964	.2061
	Agroprocessing	.30810	.14675	.647	-.1991	.8153
Agroprocessing	Agricbsiness	-.36758	.13822	.302	-.8626	.1275
	Agric Extension	-.25679	.15247	.904	-.7751	.2616
	Agric Economics	-.16703	.14843	.999	-.6783	.3443
	Animal Science	-.14806	.13560	.999	-.6406	.3445
	Crop Science	-.35326	.13361	.332	-.8442	.1377
	Agric Biotech	-.30810	.14675	.647	-.8153	.1991

Source: Field Survey, Tuoho (2022). *. The mean difference is significant at the 0.05 level.

Appendix U

Variance Inflated Factor of Variables Used in All Regression Models

Variable	VIF	1/VIF
Resident of parents	2.00	0.501226
Residents of students	1.72	0.582608
Perceive not Economically favourable	1.68	0.593535
Parents are farmers	1.54	0.647661
age	1.43	0.701668
Perceived Capital intensive	1.38	0.724266
Perceive lack of government support	1.25	0.802797
Perceived high risk	1.23	0.811622
Parents are poultry farmers	1.16	0.8646
Currently engaged in an economic activity	1.16	0.864945
sex	1.15	0.870897
Perceive lack of resources	1.11	0.897986
Perceive not socioeconomically sound	1.07	0.937911
Household size	1.04	0.958327
perceived knowledge on value chain activities	1.03	0.972826
Mean VIF	**1.33**	

Source: Field Survey, Tuoho (2022).