

**SIMON DIEDONG DOMBO UNIVERSITY OF BUSINESS AND
INTEGRATED DEVELOPMENT STUDIES**

**GRASSCUTTER FARMERS' RISK ATTITUDE, MANAGEMENT AND
CONSUMERS' WILLINGNESS TO PAY FOR GRASSCUTTER
MEAT IN UPPER WEST REGION, GHANA**

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**SIMON DIEDONG DOMBO UNIVERSITY OF BUSINESS AND
INTEGRATED DEVELOPMENT STUDIES (SDD-UBIDS), WA**

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MEAT IN UPPER WEST REGION, GHANA**

BY

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**THESIS SUBMITTED TO THE DEPARTMENT OF ENVIRONMENT AND
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DECLARATION

I hereby declare that the thesis herewith submitted for the degree the Doctor of Philosophy degree (PhD) in Environment and Resource Management at the Simon Diedong Dombo University of Business and Integrated Development Studies, Wa apart from the acknowledged references from other people's work, has not previously been submitted by me for a degree or diploma at another University or institution of higher education.

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ABSTRACT

The study aims to evaluate the risk attitude and management of grasscutter farmers in Ghana and assess consumers' Willingness to Pay (WTP) for grasscutter meat relying on the Rational Choice Theory and the Resilience Theory. A mixed method approach was employed to conduct a cross-sectional survey using structured questionnaires for grasscutter farmers (N = 52), grasscutter consumers (N = 241) and an interview guide for key informant interviews. Probit, bivariate and multivariate analyses were done using STATA version 14 for quantitative data while NVivo version 12 was used to analyse qualitative data. The results revealed that marketing and production risks were significantly associated with farmers' risk-taking experience ($p \leq 0.05$). Gender, age, educational level, the number of dependents, years of rearing experience, farm size, off-farm jobs, income, and income generated from grasscutter sales were significantly associated with farmers' risk attitude. The study showed that farmers' major management strategies were calling on experts to check sick grasscutters (M=4.71; SD=0.54), presenting clean feed to grasscutters (M=4.69; SD=0.51), and networking with colleague farmers (M=4.67; SD=0.62). The results further revealed that the resilience variables 'purpose' ($p = 0.01$), 'self-reliance' ($p = 0.02$) and 'authenticity' ($p = 0.01$) significantly correlated with farmers' resilience risk management. The study also revealed that the physical surroundings, location, availability of grasscutter meat, taste, softness or texture, loyalty, healthiness, and nutrient quality of grasscutter significantly influenced consumers' preference for grasscutter meat over other meat with a p-value = 0.01 for all. Additionally, gender, marital status, religion, education, income and household size were significantly associated with WTP. Results further showed no direct institutional policy support for grasscutter rearing in Ghana. The study concludes that farmers experience variable risks in rearing grasscutters, and intrinsic and extrinsic factors influence consumers' willingness to pay for grasscutter meat. The study makes recommendations that farmers should be continuously educated on how to minimise the risks associated with grasscutter production.

Keywords: Grasscutter, Risk Attitude, Willingness to Pay, Ghana

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DEDICATION

This thesis is dedicated to my family, most especially, Elidad M. Dery, Erika M. Dery, Melista M. Dery, and my mother; Beatrice N. Dery who all gave me peace of mind to write this thesis.

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LIST OF ABBREVIATIONS AND ACRONYMS

ACET	African Center for Economic Transformation
AIN	Ajinomoto Foundation
AOR	Adjusted Odd Ratios
CEs	Choice experiments (CEs)
Coef.	Coefficient
COR	Crude Odd Ratios
CVT	Contingent Valuation Technique
DBDC	Double Bounded Dichotomous Choice
DERS	Department of Environment and Resource Studies
EAs	Experimental Actions
FAO	Food and Agriculture Organization
FASDEP II	Food and Agriculture Sector Development Policy
FTF	Face-To-Face
GDP	Gross Domestic Product
GGP	Ghana Grasscutter Project
GIFT	Grasscutter Initiative for Rural Transformation
GIZ	German Development Cooperation
GLSS	Ghana Living Standard Survey
GoG	Government of Ghana
GSS	Ghana Statistical Service
IFAD	International Fund for Agricultural Development
IUK	Innovate UK
JICA	Japan International Corporation

KAKENHI	Japan Science and Technology Agency (JST) Program for Accelerating Social Implementation for the SDGs Achievement (aXis)
KMO	Kaiser-Meyer-Olkin
LIPREC	Livestock and Poultry Research Centre
MoFA/SRID	Ministry of Food and Agriculture/Statistics Research and Information Directorate
MWTPA	Mean Willingness To Pay Amount
NGO	Non-governmental Organization
NGOs	Non-Governmental Organizations
NRC	National Research Council
NWFP	Non-wood Forest Products
OECD	Organization for Economic Cooperation and Development
OIE	World Organization for Animal Health
PCA	Principal Component Analysis
PHC	Population and Housing Census
PhD	Doctor of Philosophy
RfFJ	Rearing for Food and Jobs
SD	Standard Deviation
SDD-UBIDS	Simon Diedong Dombo University of Business and Integrated Development Studies
SDGs	Sustainable Development Goals
St. Err.	Standard Error
UN	United Nations
UNICEF	United Nations International Children Emergency Fund
US\$	United States Dollars

USAID	United States Agency for International Development
UWR	Upper West Region
WFP	World Food Programme
WHO	World Health Organization
WTP	Willingness To Pay

CHAPTER ONE

GENERAL INTRODUCTION

1.1 Background of the Study

Animal domestication has become an important source of rural and urban livelihoods in Ghana and contributes significantly to the gross domestic product (GDP) of the country (Ministry of Food and Agriculture/Statistics Research and Information Directorate (MoFA/SRID, 2019). The production of domesticated animals also serves as an essential connection between Ghanaian farming and livelihood systems (Oppong-Apane, 2016a). Twenty percent of the contribution of Ghana's GDP share of animal products comes from domesticated animal production with an additional 6% of GDP coming from poultry production (MoFA/SRID, 2019). Significantly, the agriculture sector employs 60% of Ghanaians (MoFA/SRID, 2019). In Ghana, 40.5% of rural populations keep some livestock providing livelihoods to about 6.02 million households (MoFA, 2004). The common domesticated animal species that are kept in Ghana are ruminants (goat, cattle and sheep), pigs, poultry (ducks, guinea fowl, turkey and ostrich etc.) and non-conventional animal species produced in the country include grasscutters, rabbits, guinea pigs and snails (MoFA, 2004); Food and Agriculture Organization [(FAO, 2013)].

Poultry and micro ruminants are mostly used as food and are sold for income, especially during crop failure (MoFA, 2010). Small ruminants are a particularly important source of food security and poverty reduction for poor households in the northern parts of Ghana (Adams et al., 2021). About 70.0% of livestock and animal products are produced by smallholder farmers in northern Ghana (Oppong-Apane, 2016b). Studies show that interest in consuming conventional livestock such as goat, sheep, cattle and poultry is dwindling while consumption of grasscutter meat is increasing significantly because of its high nutrient composition (MoFA, 2004)

Grasscutter is the most harvested bushmeat in West Africa (Hoffman, 2008a). The request for both wild and domesticated grasscutter meat in Ghana is large (Abbiw et al., 2021) and support for grasscutter meat utilisation is by and large high in the West African regions (Opara and Fagbemi, 2008b). Almost 40,000 tons of grasscutter meat is eaten every year in West Africa (Mensah et al., 2005).

The economic returns of grasscutters are comparable to that of beef and much higher than most traditional livestock (Adu et al., 2017). It is an important source for rural households' food security and nutrition (Grasscutter Initiative for Rural Transformation [GIFT], 2020) and an important economic tool for poverty reduction in rural communities (GIFT, 2021).

Domestication of grasscutters started five decades ago to diversify the income levels of rural farmers and decrease the rates of exploitation in the wild (Jori et al., 1995). Other reasons were to curtail problems of zoonotic diseases and bushfires which lead to destruction of the environment and biodiversity (Adenyo et al., 2020).

Domestication is widespread in southern Ghana as a source of income. In northern Ghana, particularly in the Upper West region (UWR), domestication started in 2014 and has now spread across nine districts through initial sponsorship from Japan International Corporation (JICA) under the theme 'Enhancing livelihoods through improvement in native livestock production' and later on, the Ajinomoto Foundation (AIN) and Innovate UK (IUK) with the scope of improving livestock production, reducing wildlife harvesting, sustainable food production and natural resource management (Adenyo et al., 2020; GIFT, 2020).

However, despite the acknowledged positives emanating from grasscutter production, GIFT identified four problems along the commercial development pipeline which hamper the development of small-scale grasscutter farming businesses. These problems are: (1). The supply of grasscutters is not able to meet the demand of farmers for new stock. This is due to constraints on the scale of production and on the quality of animals produced which exhibit variable female litter sizes and high levels of male aggression. (2). Farmers lack the knowledge to optimally breed grasscutters and process for meat. (3). Farmer enterprises lack the business skills to develop small-scale commercial activities. (4). Insufficient investment and coordination to scale up the supply and marketing of grasscutter products. Current supply chains are informal and production is localised. These are risks that require efficient management at production, marketing, institutional, legal and human resource levels.

Grasscutter meat is highly valued and in high demand in Ghana (Abbiw et al., 2021). It is spread across two-thirds of the savannah belts of Ghana (Osei-Tutu, 2010) and is the

most predominant game meat in West Africa (Odebode et al., 2012). The meat has received international attention (Ahenkan and Boon, 2010). Demand for both fresh and smoked meat is very high (Odebode et al., 2012). Domestication for its meat continues to receive both international and local support. One of such support is the production of grasscutter to enhance rural livelihoods in Ghana by the Ghana Grasscutter Project (GGP) in the UWR in 2014 (GIFT, 2019; 2020; 2021; 2022). Studies have also indicated that there are no social, age, religious or ethnic prohibitions for the meat (Etchu et al., 2012). Through continuous production support, farmers in the UWR now sell both fresh and smoked grasscutter meat to consumers within and outside the region. There is also a plant set up to process grasscutter meat into various canned products such as corned, chunks canned and vacuum-packed grasscutter meat for the demanding market in Ghana (GIFT, 2020; 2021; 2022).

As a result of the increased production of grasscutters in the Upper West region (UWR) of Ghana, there is the potential to introduce grasscutter meat in food service establishments for patrons of its meat in the region. First hand, consumers' demand for healthier meat such as low-fat meat is increasing and grasscutter meat is known to contain low cholesterol and higher protein comparable to conventional meat (Hoffman, 2008a). For instance, grasscutter meat contains less cholesterol than mutton, beef and pork. It also contains 22.7% crude protein compared with 20.7% for rabbit, 19.25% for poultry and 18.2% for beef (Omole et al., 2005). As a result, consumers may be more willing to pay higher prices for grasscutter meat as a substitute for meat from traditional livestock which usually contains higher fat. This study therefore further seeks to analyse consumers' Willingness to Pay (WTP) more for this low-cholesterol and high-protein meat product. Also, consumer preferences for meat need to be understood for incorporation by food service outlets. All the same, many difficulties surrounding production, regular supply, slaughter activities, source, cost of animals and patronage need to be addressed if it is to have long-term sustainability in the food service sector.

1.2 Problem Statement

Livestock production is crucial for livelihoods in developing countries (Herro et al., 2013), contributing to public food security, economic prosperity, and asset storage (OECD/FAO, 2021; FAO/IFAD/WHO, 2021). However, adverse events like climate variability, conflicts, and disease outbreaks negatively impact livestock productivity

(FAO/IFAD/WHO, 2021). This has caused the demand for meat as a protein source to rise significantly in recent years in Ghana (GSS, 2012). MoFA (2004) reported that five percent representing over one million and two hundred thousand of rural populations in Ghana are food insecure. Quaye (2008) reported that 34% of the population of UWR were food insecure which was the highest in the northern regions of Ghana. Oppong-Anane (2011) posited that food insecurity is a result of low animal and livestock production in Ghana.

Several studies show that grasscutter production improves household dietary practices (Boakye et al., 2021; GIFT, 2021), serves as a source of additional income (GIFT, 2020; Boakye et al., 2021), conserves the environment and ecosystem (GIFT, 2020), offers employment opportunities (Boakye et al., 2021) and holds great potential in building household capacities to improve living standards and welfare (GIFT, 2020, Boakye, 2021). According to Kahan (2013), and Komarek et al. (2020), there are five general types of risks in livestock production namely: production risks, marketing risks, financial risks, institutional risks and human personnel risks. Production constraints refer to the uncertain natural growth process that farmers face (Komarek et al., 2020) such as feed (Dery et al., 2020), mortality (Dery et al., 2020), diseases (Olayemi, 2011; Adenyo et al., 2020), lack of capital and skill (Anang et al., 2011), climate (Darfour and Rosentrater, 2016), infertility (Godde et al., 2021), drought (Akinola et al., 2015) and physical hazards as well as technological failure (Akinola, 2015). Most of these production risks are beyond the control of livestock farmers and therefore make livestock production a high-risk venture. Farmers' attitudes to the risks of grasscutter production remain unknown.

Market risks are related to uncertainty in price volatility (Komarek et al., 2020), costs of inputs (Kahan, 2013; Harvey et al., 2014; Komarek et al., 2020), weather shocks and market access (Komarek et al., 2020). Another market risks are insurance (Flaten et al., 2005; Waweru, 2017), economic volatility (Darnhofer et al., 2016) and international trade uncertainties (Enahoro et al., 2021). Financial risk refers to how the farm is financed relative to the expected rate of returns (Komarek et al., 2020). Studies on financial risks include loans and their cost (Kahan, 2013; Komarek et al., 2020). Institutional or legal risks in livestock farming are those concerned with changes in policies at the local, national or international level (Kahan, 2013). For instance,

environmental risks which are part of institutional risks include pesticide use and contaminants from the waste products of livestock (Wilson, 2018).

Studies have revealed chronic bronchitis affecting livestock farmers in dusty environments (May et al., 2012; Chow et al., 2018). Lastly, personnel or human resource risks are those that affect the people involved in the management of the livestock enterprise such as accidents, death and sickness (Kahan, 2013). How livestock farmers experience risks remain unknown in the Upper West region.

Failure to manage risk effectively for farmers may lead to instability of farmers' income, poverty and food insecurity (FAO, 2015). Grasscutter meat is widely accepted and provides economic justification for sustainable production in Ghana (GIFT, 2019). Although captive breeding started some five decades ago, supply has still not met the demand for its meat because the growth of the industry is slow due to production constraints.

Nevertheless, domestication can potentially enlarge the breeding stock base and expand the grasscutter industry. Scientific findings show that farmers' risk attitude and management are useful for conventional livestock production most especially for cattle production (Flaten et al., 2005). Smallholder micro-livestock farmers are more prone to risk than other producers because they exist at the margins of the modern economy (International Fund for Agricultural Development [(IFAD), 2013]; FAO, 2016). Similarly, many grasscutter farmers easily fold up and others are reluctant to farm grasscutters because of the herald of risks and uncertainties in its production (Adenyo et al., 2020; GIFT 2021). The levels of risk aversion of micro-livestock farmers remain unknown. This reluctance could lead to a serious reduction in production and a threat to food security among rural populations. Risk taking behaviour of micro-livestock like the farmers remain little understood in the study area.

The fundamental objective of risk management of any enterprise is to ensure its survival and resilience. Therefore, improving grasscutter productivity through effective risk management is a practical way to attain broad-scale rural livelihoods. There is therefore a strong need to find theories, pathways, strategies and approaches to risks and risk management to improve and sustain the grasscutter industry in Ghana. In this context, risk management would allow grasscutter farmers to identify the most crucial risks in grasscutter farming, understand the potential livelihoods and impacts of desirable

outcomes, and identify and take appropriate steps to reduce negative impacts and failures.



Plate 1.1: Farmers complained of the sudden death of grasscutters (production risks)

Source: The Author, 2023.

Also, delivering quality food service to consumers is a daunting task as consumers continue to exhibit different expectations and preferences for food items (Adediran et al., 2020). Due to the changing nature of demographic attributes toward food preferences, there is a need for food service and the hospitality industry to understand the knowledge and factors that influence consumers' preferences and willingness to buy certain food items over others (Adediran et al., 2020). Several studies have been conducted on consumer willingness and preferences for various types of meat eaten by consumers at eateries. Notable among them include studies of (Night et al., 2005; Aeppli and Finger, 2013; Ekanem et al., 2013; Opoku-Mensah et al., 2014; Mottin et al., 2019).

These studies concentrated on goats, sheep, cow and poultry meat preferences, patronage and WTP.

A thorough literature search showed a scarcity of information on consumers' preferences and willingness to buy grasscutter meat at eateries. Few studies have already indicated consumers' acceptance and preference for grasscutter meat. For instance, Dery (2015) conducted a study on 'Assessment of the consumption trends for grasscutter meat in Ga-West Municipality and development of a thermal process schedule for canned minced grasscutter meat'. The results showed that preferences such as preparation and cooking method, cost and availability of meat significantly correlated with some individual characteristics like age, marital status and number of dependents. Also, Teye et al. (2020) conducted a study in the Central Region of Ghana to find out consumer acceptance and sensory characteristics between domesticated grasscutter and wild grasscutter meat. The results showed that consumers were more willing to accept and buy wild grasscutter meat than domesticated grasscutter meat. Their reasons were that wild grasscutter meat was tender, had better flavour and had lower fat than domesticated grasscutter meat. Another study by Odebode et al. (2012) also looked at the influence of socio-demographic characteristics and consumption patterns of grasscutter meat in Nigeria and found a significant association between age and consumption patterns of grasscutter meat.

The Ghana Grasscutter Project (GGP) has made grasscutter production popular and could stir up the demand for its meat in food service establishments in the region shortly. Grasscutter meat is more valued in Ghana due to its low cholesterol level and higher protein compared to traditional livestock (Adeyeye et al., 2017). Consumers are increasingly conscious of the bad effects of consuming high-fat meat which leads to many dietary-related diseases. However, it is unclear if consumers are willing to pay price premiums for grasscutter meat which is much healthier than traditional livestock. Therefore, there is a need to analyse the willingness of consumers to pay price premiums for this healthier meat and their preferences for the meat in the UWR.

This study leans on two aspects which include risk attitude and management of grasscutter farmers as well as assessment of consumer preferences and WTP for grasscutter meat. Hence, investigation of grasscutter farmers' risk attitudes and risk management tools is critical to incorporate appropriate responses into production

management. Additionally, analysing consumer preferences and WTP price premiums for grasscutter meat products using the double-bounded dichotomous choice (DBDC) under the Contingent Valuation Technique (CVT) approach will provide producers and processors, food service owners, investors, consultants and researchers with marketing information on grasscutter meat.

1.3 Research Questions

1.3.1 Overarching research question

How do smallholder farmers experience and manage risk in grasscutter farming and how do consumers prefer and WTP for grasscutter meat?

1.3.2 Specific research questions

- i. How do farmers experience and manage risk in grasscutter farming?
- ii. How do farmers engineer resilience as part of risk management?
- iii. What are the factors influencing preference for grasscutter meat and consumers' WTP?
- iv. How effective is institutional support for livestock (and grasscutter) production?

1.4 Objectives of the Study

1.4.1 Main objective

The Study aims to evaluate the risk attitude and risk management of grasscutter farmers in Ghana and assess consumers' preferences and WTP for grasscutter meat.

1.4.2 Specific objectives.

- i. To assess risk attitude and management strategies of grasscutter farmers.
- ii. To assess grasscutter farmers' engineering resilience as part of risk management.
- iii. To examine the factors influencing preference for grasscutter meat and consumers' WTP.
- iv. To assess the effectiveness of institutional support for livestock (and grasscutter) production.

1.5 Significance of the Study

Global meat requirement is expected to increase by 76% in the next three decades (FAO, 2012). There is therefore the need to increase animal production to meet the consumption needs (FAO, 2012). One such livestock that is in high demand is the grasscutter (Adenyo et al., 2020). The meat is in great demand not only in African urban centres but also in major global markets for Africans living in the United States and Europe (Menz, 2015; Owen and Dike, 2012). Patronage of grasscutter meat in West Africa is huge (Adenyo et al., 2020) due to its superior nutritional content (Adeyeye et al., 2012). The meat is extremely popular and commands a premium price (Adenyo et al., 2020). About 80 million grasscutters are harvested and eaten yearly in West Africa (The African Center for Economic Transformation (ACET) (2014). The economic potential is also high (Aiyeloja and Ogunjinmi, 2013; Olatidoye et al., 2019).

In Ghana, grasscutter is one of the Non-Wood Forest Products (NWFP) and is found in two-thirds of the savannah vegetation (Osei-Tutu, 2010). Meat is widely preferred and consumed in Ghana (Adenyo et al., 2020). The idea of captive breeding is to reduce the problem of hunting using wildfires (Adenyo et al., 2020; GIfT, 2020), enable the sustainability of wildlife, provide frequent income and ensure food security (Bakker et al., 2005). It does not compete with humans for food because it eats mainly grass (Adenyo et al., 2020). Also, there is a minimal land requirement for its production (Adeyeye et al., 2012) and it is now receiving massive support from government, non-governmental organisations and researchers (GIfT, 2020). In general, grasscutter production ensures the improvement of other livestock production, sustainable food production, management of natural resources and reduction of wildlife consumption and hence, offers protection to the ecosystems. Hence, minimising and coping successfully with risks in the grasscutter production value chain is important to achieving broad-scale success in the grasscutter business.

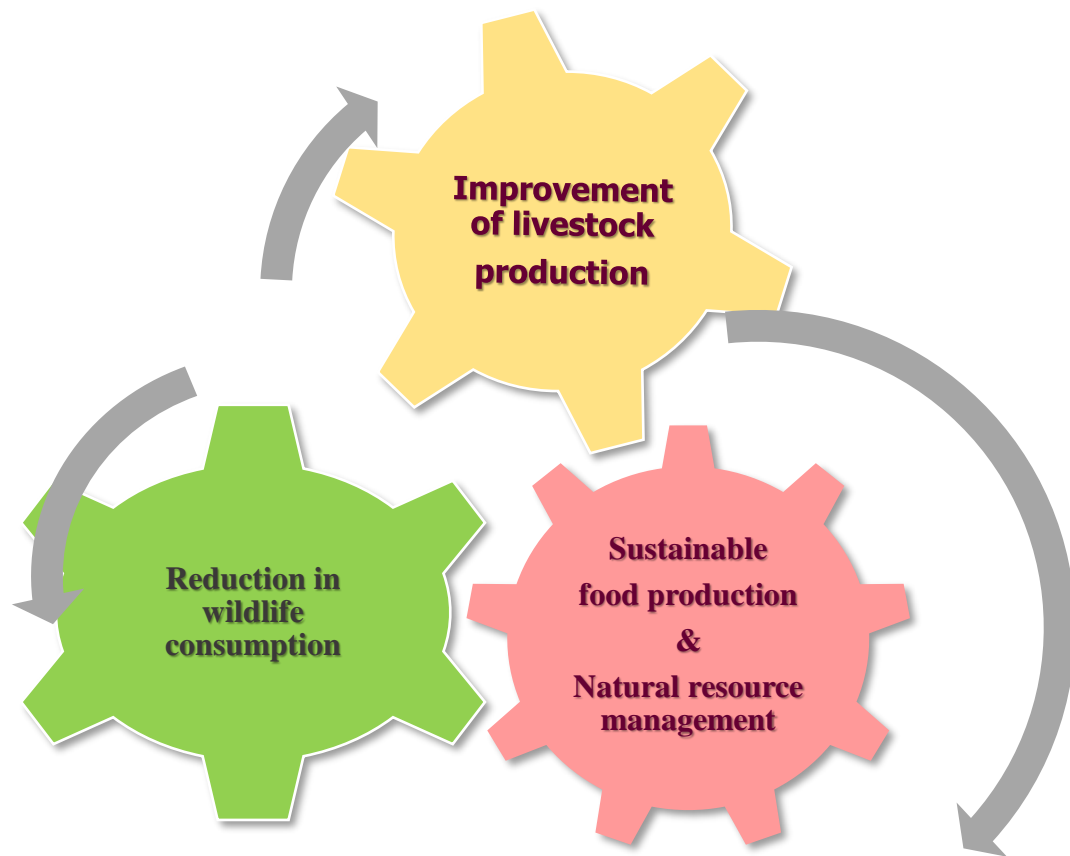


Figure 1.1: Schematic representation of the significance of the study

Source: The Author, 2023.

1.6 Scope of the Study

The study focused on the examination of risk and risk management of grasscutter farmers in Ghana. Contextually, the study evaluated the risk attitude of grasscutter producers in the UWR of Ghana, assessed the effects of farm and farmer socio-economic characteristics on the risk attitude of grasscutter producers, estimated the risk management of grasscutter producers and identified how grasscutter producers build resilience as part of risk management. Key informants' interviews were conducted with MoFA livestock officers and unsuccessful grasscutter farmers to know the institutional support, information dissemination and constraints to livestock (and grasscutter) production in the UWR. The study also analysed consumers' preferences and WTP price premiums for grasscutter meat in chop bars and restaurants. The study adopted a cross-sectional design. All grasscutter farmers that were in production and managed by GiFT in the UWR participated in the study as well as sampled consumers in the Wa Municipality. The study period spanned from September 2020 to September 2023. Data

was collected within the first half of 2022 using a structured questionnaire and interview guides designed in KoboToolbox collect software. Data management and analysis explored descriptive and regression analytical methods within the last half of 2022 and discussion of study results began in January 2023 and ended in September 2023.

1.7 Operational definitions for the study

The following operational definitions are the thoughts of the researcher which guided him to answer the research questions of the study.

Risk:

The probability of experiencing losses in the grasscutter business.

Risk attitude:

Risk attitude according to this study refers to anything that affects grasscutter farmers positively or negatively from their psychometric point of view and their willingness to accept losses.

Risk management:

Risk management as used in this study is the activities farmers perceive and undertake to ensure the survival of their grasscutter business.

Risk resilience:

The ability of grasscutter farmers to cope favourably with risks for the sustenance of the grasscutter business.

Willingness to Pay (WTP):

WTP refers to the desire to offer a higher price for grasscutter meat when a choice is available.

Risk taker:

Risk-taker refers to grasscutter farmers who are willing to take any form of risk concerning grasscutter farming to be successful.

Risk-averse:

It refers to grasscutter farmers who are not willing to take higher risks concerning grasscutter farming activities.

Risk neutral:

It refers to grasscutter farmers who lie between risk-takers and risk-averse positions.

Human capital:

In this thesis, it refers to personnel skills, knowledge and health to successfully rear grasscutters.

Natural capital:

Natural capital as used in the thesis refers to grasscutter farmers' assets such as water, good environment and other animals that can compliment successful grasscutter rearing.

Financial assets:

It refers to grasscutter farmers' economic resources in terms of monetary value that they use to pay for grasscutter farming activities.

Social capital:

It refers to the social networks, and cooperatives that grasscutter farmers belong to to get support or receive information for grasscutter rearing.

Physical capital:

It refers to human-made objects such as buildings, cars, motorbikes, bicycles or other machines that grasscutter farmers possess to enable them to rear grasscutters successfully.

Production risks:

They refer to risks concerning feed, morality, climate variability, environmental changes and disease outbreak that negatively affect grasscutter production.

Marketing risks:

They refer to the uncertainty of a ready market for grasscutter meat or its products.

Financial risks:

Financial risks refer to cost of loans grasscutter farmers have to bear for rearing grasscutters.

Human personnel risks:

They refer to issues concerning the health of grasscutter farmers or caretakers of the grasscutters.

Institutional risks:

They refer to the uncertainty of institutional and policy support from the government or MoFA for grasscutter rearing.

Concerns or constraints:

Concerns or constraints as used in this study refer to the various risks or challenges that grasscutter farmers face in rearing grasscutters.

1.8 Organization of the Study

The study is organised into eight Chapters which comprise the general introduction, literature review, study area and methodology, risk experience and attitude, grasscutter farmers' risk concerns and management, grasscutter farmers' resilience, consumer preferences and WTP for grasscutter meat, institutional support for grasscutter production, discussion of major findings and summary, conclusion and recommendations.

Chapter One (Introduction) provides a general introduction which embodies the background, the research problem statement, research questions, research objectives, significance and scope of the study.

Chapter Two (Literature Review) provides a review of the concept, theories, methods and findings from literature relevant to the study. The Chapter provides theoretical literature on risk attitude, risk management and risk resilience of livestock production including the grasscutter. Also, it provides theoretical literature on determinants of WTP and preferences for grasscutter meat as well as describes the models and conceptual framework for the study.

Chapter Three (Research Methodology) presents the methodology of the study which briefly explains the study area, the sampling procedure and the sampling size. It also outlines the methods of analyses to be used and the underlying assumptions of the study.

Chapter Four presents result on the risk-taking experience of grasscutter farmers (Risk Experience and Attitude). It analyses the association between grasscutter farmers' risk-taking experience or risk attitude (dependent variable) and five categories of risks (independent variables). It also analyses the association between the risk-taking experience of grasscutter farmers as the outcome variable and the farmer and farm

variables as the explanatory variables. The Chapter also provides results on the concerns of grasscutter farmers toward risks and grasscutter farmers' risk management. The Chapter further presents results on grasscutter farmers' engineering resilience as part of risk management using the 14-item resilience scale. The Chapter addresses research questions one and two and objectives one and two.

Chapter Five (Preferences and WTP for grasscutter meat). The Chapter presents results on factors influencing WTP for grasscutter meat as well as socio-economic determinants of WTP for grasscutter meat. It also presents results on consumers' preferences for choice/portion cuts and processing /preservation methods for grasscutter meat. This Chapter addresses research question three and objective three.

Chapter Six is based on the results of the qualitative data. It presents results on institutional support and unsuccessful grasscutter farmers. It looks at institutional support and policies for livestock production, knowledge of agricultural activities, problems confronting livestock production, knowledge of grasscutter projects in the district, grasscutter production information dissemination and perceived risks in grasscutter farming. For farmers who have not been successful in the grasscutter business, the study looks at general information on their production activities, general knowledge on agricultural production, problems confronting grasscutters and other livestock production, grasscutter production information dissemination and perceived risks in grasscutter farming. The Chapter addresses research question four and objective four.

Chapter Seven (Major findings). Chapter Seven discusses the major findings from this study from Chapter Four to Chapter Six.

Chapter Eight presents the summary, conclusion and recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This Chapter reviews relevant literature on the topic. It contains literature on the world food security situation, global and local livestock production, grasscutter production as a mini-livestock and its prospects for poverty reduction in developing countries. It also reviews literature on rural livelihood enhancement through grasscutter production, and grasscutter farming in Africa, West Africa and Ghana. It further reviews the literature on the production and housing system for the grasscutter, some common diseases of the grasscutter, and the role of the government of Ghana and non-governmental organisations in grasscutter production. The risks in livestock farming, individual and farm variables attitudes toward risks, risks and management strategies in livestock production, and risk resilience are also reviewed. The Chapter further presents the theoretical perspectives of the study which include the Rational Choice Theory, the Resilience Theory and the Consumer Choice Theory. The Chapter also presents an empirical review of consumers' preferences and WTP for grasscutter meat at eateries. It outlines the Conceptual Framework for the study and how it links with the theories to answer the research questions of the study.

2.2 Global Food Security

The global human population will reach nine billion by the year 2050 (FAO, 2012) and the majority of the food requirement will come from livestock production (FAO, 2019). Meat consumption is expected to increase by seventy-six per cent (76%) (FAO, 2019). In 2020, between seven hundred and twenty million (720 million) and eight hundred and eleven million (811 million) global population faced hunger and about two hundred and thirty-seven million (2.37 billion) did not have access to adequate food (FAO/IFAD/UNICEF/WFP/WHO, 2021). This shows an increase of one hundred and sixty-one million (161 million) people compared to 2019 figures. The recent COVID-19 pandemic and climate variability continue to melt down the world economy and stir up more global food insecurity (FAO/IFAD/UNICEF/WFP/WHO, 2021). The negative effect of the pandemic and climate variability necessitated six proposed pathways to solve global food insecurity and malnutrition. The six pathways include: (1). Integrating humanitarian, development and peace-building policies in conflict-affected

areas. (2). Scaling up climate resilience across food systems (3). Strengthening the resilience of the most vulnerable to economic adversity. (4). Intervening along the food supply chains to lower the cost of nutritious foods. (5). Tackling poverty and structural inequalities and ensuring interventions are pro-poor and inclusive. (6). Strengthening food environments and changing consumer behaviour to promote dietary patterns with positive impacts on human health and the environment (FAO/IFAD/UNICEF/WFP/WHO, 2021). Pathways (3), (4), (5) and (6) find relevance to the focus of this study.

2.3 Livestock Production

Crop farming is the major source of livelihood in many developing countries but the continuous variability and severity of climate change on the agro-ecosystem has made it unsustainable in the long term (FAO, 2010). Major crops that are farmed in northern parts of Ghana include cereal and legumes Bawa (2019) but these are inadequate to meet the nutritional needs of the people. Therefore, livestock production needs to be amplified to meet the livelihoods and nutrition needs of the global rising population estimated to reach 9 billion in the next three decades (FAO, 2012). In North-western Ghana, some of the most common livestock that are kept by the majority of rural dwellers include goats, pigs, sheep, rabbits, cattle, chicken and guinea fowl (Oppong-Apane, 2016b). Livestock provide several functions for human and ecosystem services. For instance, socio-cultural and religious beliefs are connected to livestock production (Hilmi et al., 2011; Adams and Ohene-Yankyera, 2014; FAO, 2021; Alders et al., 2021; Adams et al., 2021). Livestock provides mental and physical wellness for humans (production of therapeutic hormones, antivenom, antitoxins and xenografts) (Hassink et al., 2017; Cacciatore et al., 2020). Livestock provide monetary and socio-economic gains (Alvi et al. 201), insurance against crop failure (Hanke and Barkmann, 2017), human capital (Upton, 2004), natural, financial, social and physical capital (Folitse and Manteaw, 2019) and are a significant part of the circular food system (Milios, 2018; Van Zanten et al., 2019; Alders et al., 2021). Figure 2.1 shows the statistics of meat production from 1961 to 2018 among the continents.

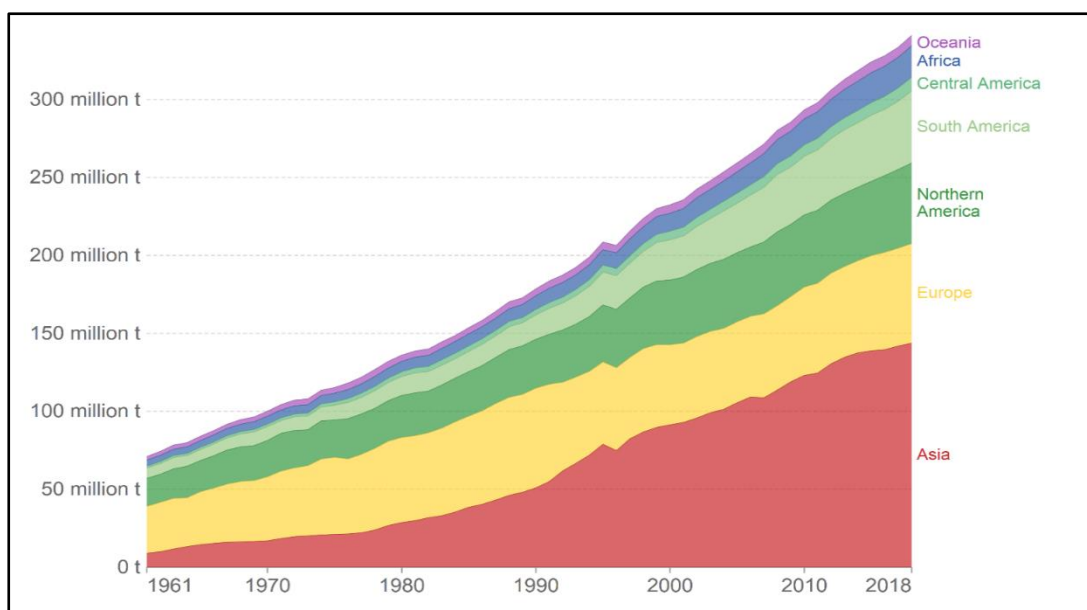


Figure 2.1: Global meat production, 1961 - 2018

Source: FAO, 2019.

Small livestock (also known as micro or mini-livestock) are particularly important in many ways (Adams et al., 2021). For instance, small livestock is essential in contributing to household nutrition especially, for the rural poor (Bettencourt et al., 2015; Adams et al., 2021), they are easier to preserve for future use due to their small size (IFAD, 2020), they provide easier and quicker liquid cash than large ruminants like cattle (Adams and Ohene-Yankyera, 2014) and improve and sustain smallholder farming system by the use of their waste products for cropping (Ominski et al., 2023). Significantly, mini-livestock contributes to twelve of the seventeen Sustainable Development Goals (SDGs) (IFAD, 2020). Table 2.1 shows the contribution of micro-livestock to twelve SDGs. According to FAO (2018), about 33% of human protein intake and 17% of calories come from small livestock production.

Table 2.1: Small livestock production and contribution to SDGs

No.	Goal	Contributions from small livestock development
1	No Poverty	Small livestock are an important source of household income and enhance their livelihood thereby reducing the rate of poverty.
2	Zero hunger	Livestock especially small livestock play important roles in household dietary protein intake. Households generate income through sales and employment in small livestock production and can purchase food for consumption and defer hunger.
3	Good health and wellbeing	Small livestock provides good amounts of nutrients for the One Health Approach and ensures higher productivity. They provide physical and psychological well-being to humans.
4	Quality education	Animal proteins improve cognitive performance and physical development of children in school (Wang et al., 2021; Balehegn et al., 2022). Income from sales of mini-livestock is also used to pay school fees.
5	Gender equality	Women are rarely engaged in large livestock production. Most of the gender-sensitive programs involving small livestock production target women thereby bridging the gender gap. Thus, the involvement of women in small livestock production enhances their status, well-being and role in the community.
7	Affordable and clean energy	The droppings from small livestock such as poultry and pigs are used to produce biogas at a cheaper cost and also renew energy by the process.
8	Decent work and economic growth	Small livestock employ the meat industry value chain and improve economic growth. Handling small animals according to standards prevents hazards to workers and improves job satisfaction.

9	Industry, innovation and infrastructure	Small livestock are sources of raw materials for innovative and value-added animal products in the meat industry. Through technology, various animal food products are available in the market.
10	Reduce inequalities	Mini-livestock production opens up the opportunity for rural entrepreneurial ventures and lessens the inequality between developed and developing countries.
12	Responsible consumption and production	The environmental footprints of mini-livestock are low and thereby reduce the need for preservation sites for livestock production. Most mini-livestock do not compete with man for food hence, aiding a sustainable food system.
13	Climate action	Unlike large livestock, small ruminants emit less greenhouse gases which destroy the climate. Production of mini-livestock will strongly contribute to the reduction of climate change hazards globally.
15	Life on land	Mini-livestock aid in the preservation of wildlife, improvement of soil fertility and various nutrient cycling within the ecosystem. The provision of farmed mini-livestock for household consumption will prevent hazards from hunting in the wild, and zoonotic infections and ensure the welfare of mankind on earth.

Source: Adapted from Keeling et al., 2019.

2.4 Grasscutter as a Mini-livestock

Grasscutter (Plate 2.1) is a mammal and belongs to the family *Thryonomyidae* (Wood, 1974). It is a wild rodent and consists of two species, the commonest species being *Thryonomys swinderianus*. It is the biggest wild rodent after the porcupine in Africa (Wood, 1974). The legs are short with five digits on the forefeet and four digits on the rear feet. The claws are thick and the incisors are yellow adjusted to feed on the hardest vegetation and prevent the teeth from overgrowing (Adenyo et al., 2020). They tend to be aggressive when approached by strangers or other animals (Dery et al., 2020; Adenyo et al., 2020). Grasscutters produce more yield meat than conventional

livestock. It is regarded as a promising mini-livestock for gaining extra income (Adenyo et al., 2020).



Plate 2.1: The grasscutter

Source: The Author, 2021

2.5 Prospects of Grasscutter Farming for Poverty Reduction in Developing Countries

Grasscutter is widely consumed at eateries in Ghana and there are farmed grasscutters in Ghana (Adenyo et al., 2020). Studies show that grasscutter farming is practiced by all ages though the majority of the farmers belong to the economically active age (Folitse et al., 2020; Dery et al., 2020). Bodies of literature have reported the economic analysis of grasscutter production (Olatidoye et al., 2019), the economic aspect of captive breeding (Adu et al., 2017) and the challenges and prospects of rearing grasscutters (Dery et al., 2020; Adenyo et al., 2020). It is an important economic tool to reduce poverty in rural communities (Olatidoye et al., 2019; Adeyno et al., 2020). Grasscutter farming also serves as an important source of rural households' food and nutrition security in West Africa (Adenyo et al., 2020; GIFT, 2020). The economic returns on rearing grasscutters in captivity are comparable to that of a cow, much higher than most livestock species and only lower than that of a pig (Adu et al., 2017).

2.5.1 Rural Livelihood Enhancement through Grasscutter Production

Grasscutter farming improves household dietary practices (Adenyo et al., GIFT, 2020; 2020; Boakye et al., 2021), and reduces wildlife consumption (Adenyo et al., 2020). It is an important additional source of income for rural dwellers (GIFT, 2020; Adenyo et al., 2020; Boakye et al., 2021) and offers a positive way of conserving the environment and ecosystem (GIFT, 2020; Adenyo et al., 2020). Grasscutter farming offers employment opportunities to the many teeming youth in rural settings in Ghana (Boakye et al., 2021; Adenyo et al., 2020) and great potential in building household capacities to improve living standards and welfare (GIFT, 2020, Boakye, 2020).

2.6 Grasscutter Farming in Africa and West Africa

Grasscutters are mostly found in the Southern part of the Sahara Dessert of Africa and dwell in grassland, along river beds, among food crops and the forest zones (Adeyeye and Jegede, 2012). *Thryonomys swinderianus* typically inhabits the East, West and Southern parts of Africa and *Thryonomys gregorianus* is distributed in the savannas in Zaire, Sudan, Ethiopia, Kenya, Zambia, Uganda, Malawi, Mozambique, Zimbabwe, Cameroon and Central African Republic (Adir, 2014) (Figure 2.2). There is great demand not only in African urban centres but also in major global markets for Africans living in the United States and Europe (Menz, 2015; Owen and Dike, 2012). Aside from the nutritional benefits of grasscutter, it also plays a significant role in African traditional medicine. It is believed that concoctions are made from grasscutters to improve the fertility of humans (Aluko et al., 2015). Also, the hair and intestines are used as seasonings in food while the pancreas with a large deposit of insulin is used to treat diabetes (Bello et al., 2012; Aluko et al., 2015).

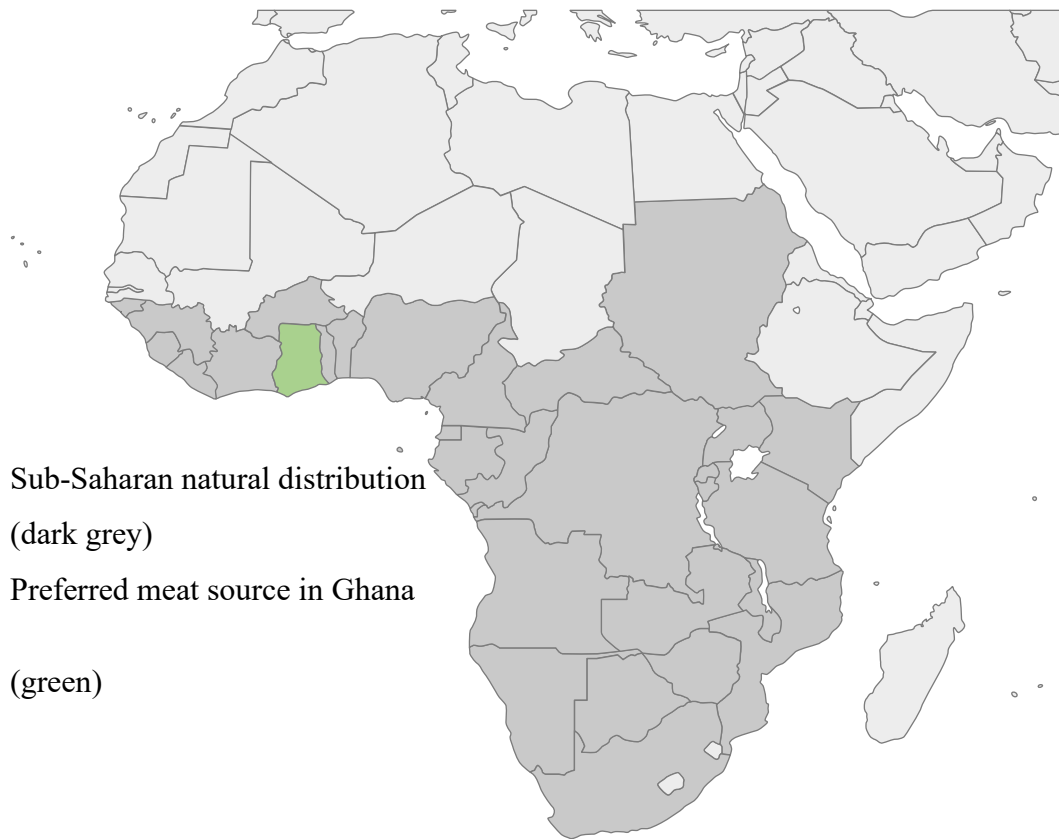


Figure 2.2: Locations showing grasscutter distributions in Africa and West Africa

Source: The Author, 2021.

There is high patronage for grasscutter meat in West Africa (Menz, 2014). About 300,000 metric tonnes of grasscutter meat is eaten annually in West Africa which represents about eighty billion grasscutters being harvested (ACET, 2014). The meat is extremely popular with premium prices (Adenyo et al., 2020) and has great potential to improve livelihoods (ACET, 2014).

Grasscutter has a huge market value in West Africa (Hoffman, 2008a). Cowlshaw et al. (2004) conducted a study to determine the most common bushmeat being traded in the Takoradi market in Ghana and found that grasscutter was the most commonly sold bushmeat. Swensson (2005) did a similar study in the Techiman market in Ghana and found that about 86% of all bushmeat traded in the market was the grasscutter.

2.7 Grasscutter Farming in Ghana

Grasscutter is one of the Non-Wood Products (NWP) in Ghana (Osei-Tutu, 2010). Domestication started five decades ago to reduce the problem of hunting using wildfires (Adenyo et al., 2020) and to enable the sustainability of wildlife and provide frequent income, ensure food security hence, breaking the vicious circle of poverty (Bakker et al., 2005; Adenyo et al., 2020). In the 2000's, Ghana started importing breeding stock from Benin where captive breeding was practiced in wooden cages but the high cost of import and uncertainty about the genetic advantages halted the initiative. MoFA in 2005 registered grasscutter as one of the min-livestock that needs to be developed in Ghana and encouraged the opening of grasscutter breeding centres in Ghana. In Ghana, grasscutter is found in all the administrative regions.

2.8 Production and Housing System for the Grasscutter Rearing

There are two main production systems for grasscutters. These are the intensive production system where grasscutters are restricted to cages made of either metal, wood, concrete or a combination of materials and the semi-intensive system where grasscutters are kept in an enclosed space (Adenyo et al., 2020). For the intensive production system, the cages can be built as a single unit or built-in tiers (Plate 2.2). For all types of cages, wire mesh is usually used as part of the body construction or to construct the doors. In Ghana, the most common type of cage used by grasscutter farmers is the three-tier wooden cage (Adenyo et al., 2020).



Plate 2.2: Wooden housing system for grasscutter (three-tier cage)

Source: The Author, 2021.

2.9 Role of the Government of Ghana and non-governmental Organisations in Grasscutter Production

The grasscutter industry in Ghana has received significant support for breeding activities such as genetic and behavioural research (Adenyo et al., 2020; GIFT, 2021). The government of Ghana through MoFA has collaborated with international organisations such as FAO, German Development Cooperation (GIZ) and Heifer International to domesticate grasscutters as a mini-livestock in the recent past. Also, many other international organisations such as Japan International Cooperation Agency (JICA), Ajinomoto Foundation (AIN), Innovate UK Agri-tech Catalyst, Japan Science and Technology Agency (JST) program for Accelerating Social Implementation for the SDGs Achievement (aXis), KAKENHI and GIFT have massively supported and encouraged grasscutter farming as a livelihood venture in the Upper West region of Ghana (Adenyo et al., 2020; GIFT, 2020; 2021; 2022). Since extension services to farmers correlate with higher production (Tembachako and Mrema, 2016), MoFA extension agents and GIFT field officers have been collaborating on extension services offered to the grasscutters in the Upper West region. Importantly, a lot of research

institutions have collaborated and support is given to conduct studies in breeding stock improvement, farm supply, farm husbandry, meat processing, meat marketing and market development (Adenyo et al., 2020; GIFT, 2020; 2021). Some breeding centres in Ghana involved in grasscutter production include Nungua Livestock Breeding Station and the Livestock and Poultry Research Centre (LIPREC), University of Ghana, Legon.

2.10 Risks in Livestock Farming

Generally, farming comes with several risks and farmers are concerned because they cannot predict the risks with certainty (FAO, 2013). The term, 'risk' has been defined variously by many researchers. In the view of Harwood et al. (1999), risk is any kind of loss. According to Legesse and Drake (2005), risk refers to an unfavourable outcome. Hardaker (2000) interpreted risk in three possible phases which include the possibility of a bad outcome, variability of an outcome and the uncertainty of an outcome. There are several studies on the risks involved in livestock production (FAO, 2013; Kahan, 2013).

Broadly, risks in livestock production are perceived and categorised into five sources, these include production, marketing, financial, institutional and human personnel risks (FAO, 2013; Kahan, 2013). Production risks arise from the eccentric nature of the weather and vulnerability around the performance of crops or animals, disease and pests (Kahan, 2013).

The marketing risk alludes to the costs of farm inputs and yields, demand and cost of a product (Kahan, 2013). The financial risks refer to loans and their costs while the institutional risks include policies and legislation concerning the product (Kahan, 2013). On the human personnel risks, Kahan (2013) referred to illness, accidents and death.

Risks in livestock farming are changing rapidly and with high severity (FAO, 2013). These changes are mainly caused by two forces namely climate variability and liberalisation of markets. Farmers are unable to predict environmental factors such as droughts, fire, and severe rainfall that can destroy agricultural farmlands including livestock. These disasters when occur can affect the market directly resulting in price hikes of inputs for agricultural production leading to high food insecurity at the local,

national and global levels (FAO, 2013). Among all the categories of risks, Meuwissen et al. (2001) observed that production risk is positively and significantly associated with livestock farmers.

2.10.1 Some Common Diseases of the Grasscutter

The outbreak of diseases in livestock production is generally common among rural farmers as a result of poor veterinary services available to them. Limited access to animal healthcare (Grace et al., 2017) and poor veterinary services (FAO, 2012; Haakuria et al., 2020) have been reported. Just like other livestock species, grasscutter is a great reservoir of infectious diseases. For instance, helminths (Opara and Fagbemi, 2008; Futagbi et al., 2010; Aboagye et al., 2019), abscesses, pneumonia and cardio-splenic dilation (Opara, 2010) and Hymenolepis (Akinola et al., 2015) have been reported to cause high mortality in grasscutters. In Nigeria, Olayemi (2011) detected worms infestation in grasscutters with a high prevalence of Nematodes and Cestodes. Some of the Nematodes were *Ascaris* sp., *Oesophagostomum* sp., *Bunostomum* sp., *Trichostrongylus* sp., *Strongyloides* sp., *Nematodirus* sp, *Trichuris* sp., *Haemonchus* sp., and *Strongyles* sp. The Cestode isolated was *Taenia* sp. Also, *Eimeira oocyst* was the only protozoan parasite identified in the analysis.

2.10.1 Risk attitudes

Theories suggest that risk attitudes influence the way farmers manage risks (Hardaker et al., 1997). Attitude is a favourable or unfavourable feeling toward a stimulus (Largerkvist, 2005). Various theories (expected utility theory, prospect theory and safety-first theory) (Bard et al., 2000) and various estimation techniques such as direct elicitation of utility functions, experimental procedures with hypothetical questionnaires and inference from observation of economic actions have been used to study farmers' risk attitudes (Dadzie and Acquah, 2012). Studies on attitude are more central in psychology for predicting future behaviour and it serves as a major driving factor for risk perception (Sjöberg, 2003). Scholars argued that attitude is better studied when it is linked to specific sources of risks because those attitudes will influence the way risks are managed (Hardaker and Anderson, 1997). Risk attitude is usually a latent variable because it cannot be observed directly but the various risk behaviours that are measured on an attitudinal scale form the basis for correlation among the responses. Many methods have been developed by researchers to determine risk attitudes. These include the risk attitude scale as used by Meuwissen et al. (2001) and Flaten et al. (2005)

and self-assessment as used by Bard and Barry (2000). Recent studies (Bishu et al., 2016; Meraner and Finger, 2019; Hayran et al., 2021) also employed five-point ordinal questions to study risk attitude and risk management strategies of farmers.

2.10.2 Determinants of Farmer Individual Risk Attitude

2.10.2.1 Age

Several studies have been conducted to determine the association between age and risk attitude of farmers. Variable results were obtained from these studies. While studies such as Deakin et al. (2003), Sherrick et al. (2004), Mischra and Godwin (2006) found positive risk aversion for age, Ullah et al. (2015) found the opposite findings for age. Other authors Flaten et al., (2005), Picazo-Tadeo and Wall (2011) and Ye and Wang (2013) did not find any significant relationship between age and risk attitude.

2.10.2.2 Gender

The most widely reported farmer individual characteristics studied with risk attitude is gender. Results of Brick et al., (2012), and Ye and Wang (2013) revealed that female farmers are more risk-averse than males and would not want to take higher risks. The study of Andersen et al. (2007) however, did not find any significant relationship between gender and risk attitude.

2.10.2.3 Educational level

Education is another individual determinant for risk attitude that is mostly studied concerning risk attitude. For instance, Meuwissen et al. (2001), Jing et al. (2001), Aye and Oji (2005), Mischra and Godwin (2006), Dadzie and Acquah (2012) and Iqbal et al. (2016) reported that higher educational status positively correlates with a risk attitude. While Ullah et al. (2015) reported the opposite result, Ye and Wang (2013) did not find any significant relationship between education level and risk attitude.

2.10.2.4 Number of dependents

Some studies by Ye and Wang (2013) and Ullah et al. (2015) revealed a positive correlation between family size and risk attitude. However, Hallahan et al. (2004) and Dohmen et al. (2011) revealed an opposite relationship between the number of dependents and an individual's risk aversion. There was no significant relationship between an individual's risk aversion and the number of dependents in Picazo-Tadeo and Wall (2011).

2.10.2.5 Household size

In the study of Dadzie and Acquah (2012), increased household size correlated positively with the risk attitude of farmers. However, the studies of Hallahan et al. (2004) and Dohmen et al. (2011) revealed that increased household size is more risk-averse. Picazo-Tadeo and Wall (2011) reported no significant result for household size concerning risk attitude.

2.10.3 Determinants of Farm Variables Risk Attitude

2.10.3.1 Years of rearing experience

A farmer's years of rearing experience is an important determinant for studying risk-taking experience. Some studies such as Aye and Oji (2009), Ullah et al. (2015) and Iqbal et al. (2016) found experience positively correlated with risk attitude while Flaten et al. (2001) found uncorrelated results. However, Ye and Wang (2013) reported mixed results.

2.10.3.2 Farm size

Farm size has also been used by researchers as a proxy to study risk attitudes. Various mixed results have been reported from the studies. Studies by Jing et al. (2001), Meuwissen et al. (2001), Flaten et al. (2005), Lucas and Pabuayon, (2011), Ullah et al. (2015), Iqbal et al. (2016) Bishu et al. (2016), Van Winsen et al. (2016) and Ngarava et al. (2018) found a positive correlation between farmers with larger farm size and risk attitudes. However, Velandia et al. (2009) reported contradictory results.

2.10.3.3 Off-farm jobs

Studies concerning the association between risk attitude and off-farm jobs are limited in the literature. Few authors attempted to study the relationship between risk attitude and the off-farm job of farmers. These authors came up with mixed results. For instance, Flaten et al. (2001) and Mischra and Godwin (2005) reported a significant positive association between off-farm jobs and farmers' risk attitudes. Also, Ullah et al. (2015) and Iqbal et al. (2016) revealed that farmers who earn income from off-farm jobs are less risk-averse than those without off-farm earnings. However, the finding of Sulewski & Kłoczko-Gajewska, (2014), risk aversion on average increased among farmers with off-farm income than those who were not engaged in any off-farm job earning activity.

2.10.3.4 General Farm Income

Farmers' risk aversion reduces with rising wealth, according to Meuwissen et al. (2001), Flaten et al. (2005), Aye and Oji (2009), Dadzie and Acquah (2012) and Ye and Wang

(2013). But according to Iqbal et al. (2016) and Ullah et al. (2015), the association between income and risk-taking behaviour was either positive or non-significant.

2.11 Farmers' Risks Concerns

There are several reports on concerns or constraints in livestock farming including the grasscutter farmers. For instance, reports about theft (Anang et al., 2011), financing (Anang et al., 2011), marketing (Anang et al., 2011), feeding (Anang et al., 2011; Bishu et al., 2016; Tembachako and Mrema, 2016; Dery et al., 2020; Adenyo et al., 2020), inadequate technical know-how (Anang et al., 2011), diseases and mortality (Salman et al., 2014; Dery et al., 2020; Adenyo et al., 2020), medication (Bishu et al., 2016), lack of veterinary services (Haakuria et al., 2020), lack of capital or credit (Anang et al., 2011; Kahan, 2013) and lack of breeding stock (Kahan, 2013), have been documented in the literature.

2.11.1 Risks and Management Strategies in Livestock Production

According to Kahan, (2013), risks reduce the willingness of farmers to venture into activities and investments that have higher gains but also have some chance of losses. A suitable risk perception is necessary for the correct choice of the best management strategy for any kind of risk. Farmers therefore need to understand and know the risk that occurs to enable them to manage them appropriately (Adeyonu et al., 2021). According to a report by the Organisation for Economic Cooperation and Development (OECD) (2013), risk management strategies utilised by farmers are influenced by their characteristics, such as socioeconomic variables and risk attitudes or perceptions. Coordination of efforts at the state, market, and farm levels is necessary for effective risk management in agriculture, with the farm and farmer characteristics being the most crucial factors. Therefore, investigations of farmers' risk attitudes or perceptions are of great importance in farm risk management. The farmer is in the best position to know the aspects, attributes and extent of the risks that affect his farm business. It is the responsibility of the farmer to make the appropriate decisions to manage the risks associated with agricultural enterprise. The farm characteristics include farm size, type, stock, off-farm income, and farm income among others while the farmer characteristics include the socio-economic characteristics of farmers such as age, gender, education, household size, marital status and occupation.

Additionally, farmers' risk perception, attitude and management strategies vary greatly according to location and farm type (Ullah et al., 2016). For instance, a study by Flatten et al. (2005) showed that insurance, disease prevention and financial measures are the most popular risk management strategies adopted by Norwegian cattle farmers. According to Akinbile et al. (2013), poultry farmers perceived scarcity of water, feed and failure to vaccinate as the most important risk sources. Their management strategies were mainly on mixed farming, purchase of improved poultry breeds and vaccination to avert mortalities. In a similar study by Salman et al. (2014) among poultry farmers in Nigeria, input and output price variability as well as disease infections were considered the most important risk sources. The farmers adopted timely vaccination and pen relaxation as their management strategies. Corroborative studies by Effiong et al. (2014) and Babalola (2014) among poultry farmers in Nigeria also pointed out that the most important risk sources in poultry production were climate variability and high mortality rate. The farmers managed these risks through diversification and seeking cooperative support. In Ethiopia, farmers' important risk sources as identified by Bishu et al. (2016) were shortage of family personnel, minimal farm income and high cost of fodder to feed their livestock. The study found that farmers adopted the use of credit, vaccination and control of parasites as their management strategies. In South-West Nigeria, a study by Adeyonu et al. (2021) identified production, financial and human personnel risks as the major important risks among poultry farmers. Their management strategies for managing these risks include prevention of disease infections and prudent financial management. Among dairy cattle in Kenya, prevention of disease infections, the use of insurance and good financial management were their management strategies for risks (Waweru, 2017).

According to Waterman (2002), responses to risk or management strategies are categorized into retain, shift, reduce, and self-insure. For instance, presenting clean feed to grasscutters has been identified as a major risk management strategy for grasscutter farmers (Folitse et al. 2020; Dery et al. 2020; Adenyo et al. 2020). The marketing response to risk in livestock production according to Drollette (2009) includes selling the stocks in advance on agreement with buyers and expanding the networks for potential buyers. The financial response to risk is to reserve a huge sum of cash as a cushion against failure whereas the response risk on integration is the combination of all the types of risks. Flatten et al. (2005) and Waweru (2017) identified that preventing

diseases and reporting illness to extension workers have been the major management strategies among cattle farmers in Norway. The ability of farmers to identify and solve problems in their farms as part of their management strategies has been reported among grasscutter farmers in a study by Dery et al. (2020).

2.12 Variables of Resilience

Earlier research on resilience has largely focused on individual factors that distinguished individuals with better-than-expected outcomes from those with poor outcomes (van Breda, 2001). For instance, constructs such as coherency (Antonovsky, 1979), hardness (Kobasa, 1979) and self-efficacy (Bandura, 1977). These conventional constructs have been built on to include several other individual variables such as problem-solving skills, intelligence, motivation, faith and hope which gained much prominence in resilience studies (Southwick et al., 2014). Others include relationships or social support (Hartling, 2008), self-esteem (Ungar, 2004), genetics (Rutter, 2013), technology and demographic characteristics (Southwick et al., 2014), adaptability, risk-taking, determination, tolerance, fear of failure and perseverance (Ungar, 2004; Bonanno, 2004; Masten, 2005), mission (Ungar, 2004), mentors and development programs (Zimmerman, 2013). Additionally, other variables reported include self-enhancement; repressors of emotional dissociation; positive emotion and laughter; personal energy encompassing physical, emotional, mental and spiritual energy, core personal and professional values and personal efficacy (Patterson and Kelleher, 2005). Determinants of resilience therefore holistically comprise biological, cultural, social and psychological factors that interact among themselves in a cause of response to risk or adversity (Southwick et al., 2014).

2.13 Theoretical Framework

A lot of research theories on risks in agriculture and their management are available in scholarly literature including (Hardaker and Anderson, 1997). In trying to explain the risk attitude or risk behaviour of farmers, Huirne (2002) used several theories such as decision-making theory, system theory and objective theory. In the decision-making theory, Huirne explained that a decision is made after a stepwise process is followed to arrive at the best solution to a problem. The system theory points to the fact that decision-making is influenced by the context an individual or a system operates. That

is to say, the individual or organisation is a subset of a larger system and therefore takes decisions as influenced by that larger system or the context. The objective theory states that decisions are taken based on the goals of the entity or organisation one belongs. Other researchers Ogu (2013) and Ainsworth et al. (2020.) explain the social, economic and individual behaviour of people toward risk responses using different theories.

This study investigated the interaction of concepts relating to risks, risk management and resilience within the grasscutter industry in Ghana. It is difficult to investigate these production systems with a single theory, so the study combines two theories namely: Rational Choice theory and Resilience theory. Expected utility theory is the most widely accepted normative model of rational choice (Meyer, 2000) that economists have used and also as a descriptive model of decision-making under risk (Meyer, 2000). Numerous studies have, however, criticised the expected utility hypothesis on descriptive grounds because it fails to describe observed behaviour (Moschini and Hennessy, 2001). The best way to describe decision-making behaviour, according to Beresfed and Sloper (2008) is to understand the individual's frame of reference for evaluating choices with uncertain outcomes because the decision maker's perceptual world is that person's reality and forms the basis for his or her choices. The attitudinal approach involves a set of statements that reflects an individual attitude toward an underlying variable to establish a score that reflects a quantitative construct of the attitude. The approach based on the rational choice theory does not explain the behaviour that drives the attitude, thereby skipping the conventional theories that are loaded with criticism (Bard and Barry, 2001; Meuwissen et al., 2001; Flaten et al., 2005).

The main purpose of risk management of an enterprise is to ensure its resilience (Louisot, 2015). Greene (2002) used various phrases such as 'competence in daily functioning', a polar opposite to risks', influenced by diversity such as age, gender, ethnicity, economic status, religion, mental and physical well-being, and 'availability of environmental resources as components of resilience. Zimmerman (2013) used the resilience theory to explore variables which operate in opposition to risks and how individuals overcome the negative effects of risk exposure. The theory helps to identify both internal and external resources critical for risk management (Zimmerman, 2013). Ledesma (2014) thinks that applying the resilience theory helps to understand individual variations in response to risk. Therefore, in the context of this study, the

theory helps to understand how grasscutter farmers respond to risks or survive and respond well to risks.

2.13.1 Rational Choice Theory

Rational Choice Theory also known as Rational Action Theory or Choice Theory is extensively used in social science to understand the social, economic and individual behaviour of people (Ogu, 2013). The theory is built on a very basic foundation pointing to the fact that individuals are goal-oriented and pursue their goal-oriented behaviour based on rational preferences (Ainsworth, 2020). The rational theory model offers many strengths in determining an individual behaviour. Advantageously, it is the most unique framework for assessing individual social behaviour and attitude (Becker, 1976), the most rigorous theory of social action (Rogowski, 1997) and the ‘universal grammar’ of social science (Hirshleifer, 1985). Additionally, the model is very general, parsimonious and predictive of individual behaviour (Ogu, 2013). As the name suggests, the theory allows people to choose from several options or courses of action presented to them based on the belief that the choice made will best serve the interest of the individual (Elster, 1989). Five assumptions have been proposed by Abell, (2003) on rational choice theory.

- 1). Individualism. Under individualism, Abell (2003) argued that the individual as a being is self-maximising, calculating the greatest benefits that will emanate when given several alternatives and self-seeking for individual interest. Out of this primary assumption are four other assumptions of the rational action theory as continued below.
- 2). Optimality: Under this assumption, Abell pointed out that individuals choose what is optimal for them and prefer their choices over other alternatives. He however stressed that the choice made by an individual may not necessarily be the best of social action but that the choice made is the most preferred based on the circumstances or the cause of actions presented to the individual.
- 3). Structures: There are special cases where structures and norms destroy the model of the rational choice theory. For instance, if individuals are confronted with one cause of action, it makes it difficult to make any choice. In this case, the choice becomes disharmonised and does not show equality and consensus. This can become a disadvantage to individuals with few resources.
- 4). Self-regarding interest. This assumption postulates that individuals are only interested in pursuing their goal-oriented behaviour or preferences that best sum up

their goals and welfare. Despite the value of this assumption, it is not as important as the assumption of optimality because group sentiments could arise such as unions, cooperation and charity which contradict an individual's optimality.

5). Rationality. This assumption sums up that individuals undertake social actions that best serve their interests or preferences which give them optimal advantage.

Greene (2002) summarised the steps involved in deciding rational choice theory including the definition of the problem, identifying the decision criteria, weighing the criteria, generating valid alternatives, rating it alternative on each criterion and calculating the optimal decision.

2.13.2 Resilience Theory

Several researchers Luthar et al. (2000), Masten (2005), Rutter (2013) and Southwick et al. (2014) defined resilience variously and contextually in social science. One such definition by Rutter (2006) states that resilience refers to 'an interactive concept that is concerned with the combination of serious risk experiences and a relatively positive psychological outcome despite those experiences. He further asserts that resilience is more than social competence, to wit; competence must exist with risk to resilience. In 2013, Rutter refined his definition of resilience by stating that resilience is when an individual has a relatively positive outcome amid adversity better than their counterparts in a similar circumstance. Other definitions include the ability to rebound after adversity, become stronger and more resourceful (Walsh, 2006), the ability of a system to function successfully after adversity (Yates et al., 2015), the stability of a healthy system after it has experienced risks and lessons learned from such adversities (Southwick et al., 2014), the capacity to adjust successfully after major adversity (Theron, 2016). Conceptually resilience is a process that leads to an outcome through mediating processes (Van Breda, 2018). Based on this concept Van Breda, (2018) defined resilience as 'the multilevel processes that systems engage in to obtain better-than-expected outcomes in the face or wake of adversity'. The keywords in the definitions are multilevel, systems mediating processes and better-expected outcomes. Multilevel denotes that the resilience process passes through a multistage system of the social ecology or the person in the environment but not only in the individual. Systems include families, cells, communities, individuals, organizations, economy and climate among others.

2.13.3 Models of Resilience Management

Three models are used extensively in the literature for resilience studies. These include the protective factor model, the compensatory model and the challenge model. The compensatory model is used to defuse exposures to risk factors. The compensatory model factors include optimism, empathy, insight, intellectual competence, self-esteem, direction or mission, and determination and perseverance (Ungar, 2004). The challenge model according to O’Leary (1998) is a risk factor that improves an individual adaptation to risks provided the risk is not too severe and prepares the individual to handle future challenges. The last model is the protective factor model where by protective factors and risk factors interact to lessen the probability of risk occurrence (O’Leary, 1998). The ability to recover self-esteem, academic and professional skills, intrapersonal reflecting skills, emotional management abilities, planning abilities, life skills, and problem-solving abilities were among the protective factors found (Ungar, 2004).

2.14 Conceptual Framework

There have been several reports on risks and threats such as diseases, theft, drought and conflicts among livestock farmers in Africa. These risks make them vulnerable leading to shortfalls in livestock production (Nuvey et al., 2021) and worsening the livelihood capacities of livestock farmers (Nuvey et al., 2021). Apart from the risks associated with climate variability, other constraints in livestock production include the cost of inputs, markets available for products and communication problems (FAO, 2019). These risks are normally studied in isolation without looking at the attitudinal response and capacity of the individual to overcome them when they occur. The capacity of an individual to overcome constraints when they arise is resilience (Nuvey et al., 2021). The argument therefore is that risks or constraints in livestock farming must be combined to understand widely the attitude and ability of the individual to recover and sustain production in the face of adversity. Therefore, understanding how grasscutter farmers take risks and engineer resilience as part of managing their grasscutter enterprise is essential for future programs geared toward grasscutter production in Ghana.

Several studies have been conducted to determine the influence of socio-economic variables (farmer and farm characteristics) on the risk attitude of farmers. Some of these

include studies by (Aye and Oji, 2009; Sherrick et al., 2004; Mischra and Goodwin, 2005; Mischra and Goodwin 2006; Flaten et al., 2006). To determine the association of farmer and farm variables' effects on risk attitudes and risk management a risk attitude model developed by van Raaij (1981) and used by Meuwissen et al. (2001) and Flaten et al. (2005), Borges and Machado, 2012) for risk management will be modified and integrated for use in this study. Van Raaij's model of Economic-psychological relationships produces insights regarding the decision-making process. The model investigated the relation between farm and farmer characteristics and risk perception and as a second step the influence of risk perception on the economic behaviour of farmers. In this study, the relationship between farm and farmer characteristics and risk attitude was investigated as well as the relationship between risk management strategies and grasscutter farmers' adaptive capacities (resilience).

The resilient scale (R-14) or (R) has been previously used widely by several researchers (Wagnild, 2009); Nuvey et al., 2020) which directly measures five attributes of resilience on a 7-point Likert scale was modified and used to assess how grasscutter farmers engineer resilience. These attributes are purpose (three items), equanimity (two items), self-reliance (five items), authenticity (two items) and perseverance (two items). Wagnid and Young (1993) defined purpose as the ability to understand the context of a situation in which the individual finds himself. Resnick and Inguito (2011) and Callegari et al. (2016) used the item 'My life has a meaning' as a construct to measure how farmers adapt to adversity and found it positively correlated with the R-14 scale.

2.15 Model Application

The study employed many models to achieve the set objectives. These directional model relationships describe the topic this thesis is about.

2.15.1 Model for estimating risk attitude on categories of risks

Model one shows a regression model involving a risk attitude construct and five categories of risk types (Figure 2.4).

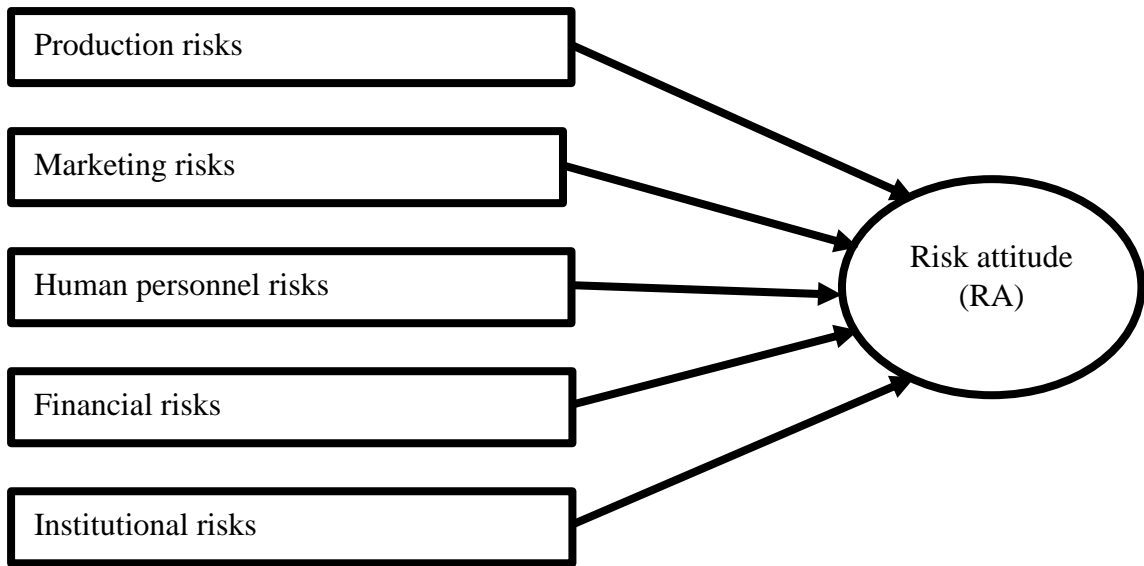


Figure 2.3: Model framework for estimating the relationship between risk attitude and risk categories

Source: Author’s construct, 2023.

$$RA: \beta_0 + \beta_1 \times \text{Production risks} + \beta_2 \times \text{Marketing risks} + \beta_3 \times \text{Human personnel risks} + \beta_4 \times \text{financial risks} + \beta_5 \times \text{Institutional risks} + \epsilon_{it} \quad (1)$$

..... Equation 2.1.

2.15.2 Model for estimating the relationship between risk attitude and farm and farmer variables

Model two shows a regression model involving risk attitude construct (RA) as the dependent variable and the interaction between farmer individual variables (FIV) and farm variables (FV) (Figure 2.5).

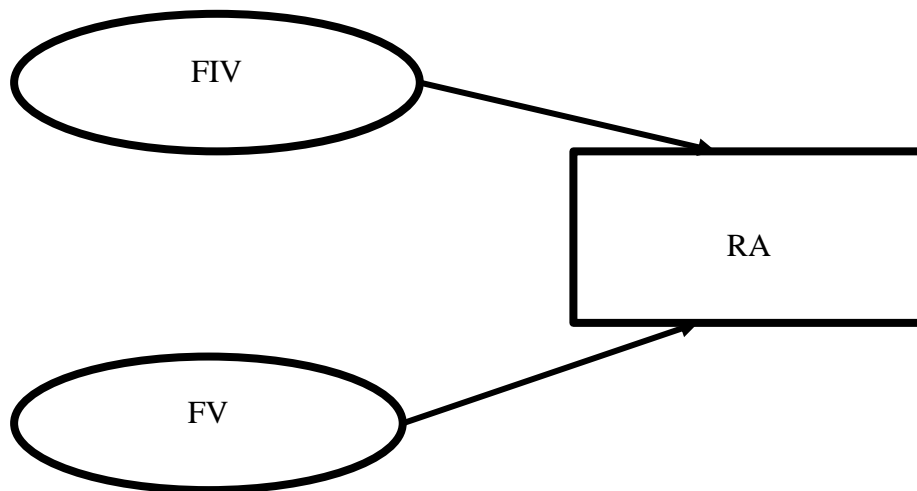


Figure 2.4: Model framework for estimating the relationship between risk attitude and farm and farmer variables

Source: Author’s construct, 2023.

FIV = Gender, Main occupation, Household size, Number of dependents, Region and Ethnicity

FV = Years of rearing, Farm size, Off-farm job, Main source of income, Main source of finance, General farm income, and Income from grasscutter sales

$$RA: \beta_0 + \beta_1 \times \text{Gender} + \beta_2 \times \text{Age} + \beta_3 \times \text{Marital status} + \beta_4 \times \text{Educational level} + \beta_5 \times \text{Main occupation} + \beta_6 \times \text{Household size} + \beta_7 \times \text{Number of dependents} + \beta_8 \times \text{Region} + \beta_9 \times \text{Ethnicity} + \beta_{10} \times \text{Years of rearing} + \beta_{11} \times \text{Farm size} + \beta_{12} \times \text{Off-farm job} + \beta_{13} \times \text{Main source of income} + \beta_{14} \times \text{Main source of finance} + \beta_{15} \times \text{General farm income} + \beta_{16} \times \text{Grasscutter sales} + \epsilon_{it} \quad (2) \dots\dots\dots \text{Equation 2.2.}$$

2.15.3 Model for estimating the relationship between Risk Management (RM) construct and five resilience constructs

Equation three shows a regression model involving RS-14 items latent constructs and risk management strategies construct of grasscutter farmers (Figure 2.6).

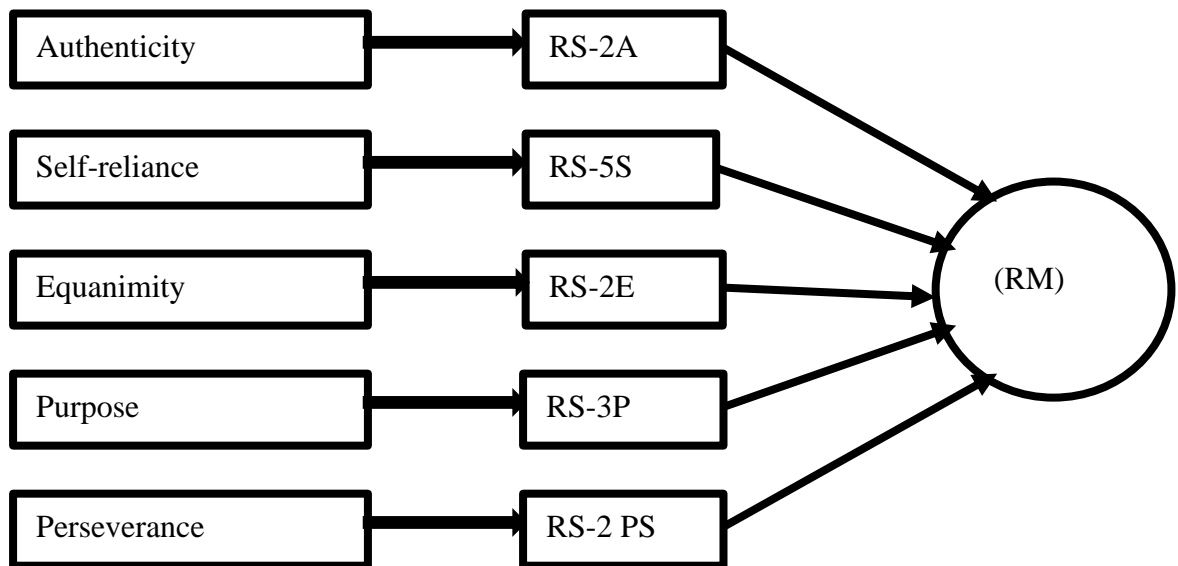


Figure 2.5: Model framework for estimating the relationship between Risk Management (RM) construct and five resilience constructs

Source: Author’s construct, 2023.

RS-2A = authenticity scale items resilience construct

RS-5S = self-reliance scale items resilience construct

RS-2E = equanimity scale items resilience construct

RS-3p = purpose scale items resilience construct

RS-2PS = perseverance scale items resilience construct

RS-14 (R) = resilience scale items construct

RM = Risk management items scale construct

RM: $\beta_0 + \beta_1 \times \text{Self-reliance} + \beta_2 \times \text{Purpose} + \beta_3 \times \text{Equanimity} + \beta_4 \times \text{Perseverance} + \beta_5 \times \text{Authenticity} + \epsilon$ (3) Equation 2.3.

2.15.4 Operational Variables

Table 2.2 shows the individual and socio-economic explanatory variables used in this study.

Table 2.2: Operationalisation of independent variables on dependent variables (risks attitude) for regression analysis

Explanatory variable	Description of variable	Measurement	Slope of coefficient	Apriori
Gender	Gender of respondents	Categorical	β_1	+/-
Age	Age group of respondents	Categorical	B2	-
Marital status	Marital status of respondents	Categorical	B3	+/-
Education	Educational level of respondents	Categorical	B4	+
Main occupation	Main work of respondents	Categorical	B5	+
Household size	Number in a household	Categorical	B6	+/-
Dependents	Number of dependents	Categorical	B7	+/-
Home region	Region of respondents	Categorical	B8	+/-

Ethnicity	Ethnic background of respondents	Categorical	B9	+/-
Religion	Religion of respondents	Categorical	B10	+/-
Years of rearing	Years of rearing grasscutters	Categorical	B11	+
Farm size	Number of grasscutters kept	Categorical	B12	+/-
Off-farm job	Off-farm job	Categorical	B13	+
Main source of finance	Main source of financing grasscutter activities	Categorical	B14	+
General farm income	General farm income of farmers	Categorical	B15	+
Grasscutter sales	Sales made from grasscutters	Categorical	B16	+

2.16 Theoretical Review of Consumer Preferences and WTP

Consumer preferences and WTP are two important measures for business and market development (Dutta et al., 2014). According to Sobotka (2019), willingness to pay is the amount a consumer is willing to pay for a commodity or a service. Economics and market researchers have used CVTs, Choice experiments (CEs) and Experimental Actions (EAs) or combinations of two or more of these methods to elicit consumers' WTP and preferences for food products (Gao and Schroeder, 2009). Theoretically, CVT utilizes the theory of consumer behaviour, where a rational consumer aims at maximizing utility from any bundle of goods subject to a given budget constraint. Since grasscutter meat has better sensory, and quality attributes and higher preferences than meat of other livestock (Omole et al., 2005; Hoffman, 2008a; Dery, 2015), consumers have the alternative to choose one over the other when these bundles of goods are presented to them. Usually, consumers make trade-offs among two or more alternative bundles of goods. Trade-offs have been studied extensively in the domain of utility (Smith and Brynjolfsson, 2001). The trade-offs consumers make for any bundle of goods are always expressed in their WTP for those goods under a constraint (Vidogbéna

et al., 2015). The best framework that explains consumers' preferences and alternate choices for similar or unrelated product attributes is the random utility theory and the Lancaster demand theory. Lancaster postulated that the attributes of a commodity rather than the commodity itself offer utility to the consumer. That is to say that the probability of choosing one commodity over another is the sum of the utilities of the attributes of the product. This study leans on grasscutter meat as a healthier meat than the conventional counterparts as a composite commodity together with other several attributes with reference to the Consumer Choice Theory in order to draw the random utility empirical model. In this regard, WTP for grasscutter meat (healthier meat) leans on the microeconomic theory of utility maximization where the consumer's objective is to maximize his or her utility under a constraint (fixed budget). Usually, econometric models of probabilistic choice are used to analyze the change in consumer utility (WTP) and the predictive factors influencing the utility. This utility function consists of an observed deterministic component stated by the consumer or observed through consumer actions or choices and an unobserved random component arising from omitted attributes, discriminatory errors and unmeasured preferences (Hess et al., 2018). Leaning on this consumer behaviour, Deely et al., (2022) and Saha et al. (2022) reiterated the economic theory of price, goods and services used by consumers.

2.16.1 Socio-economic Factors Influencing Preference and WTP for Meat Products

Variables such as age, gender, marital status, religion, educational level, number of dependents, household size and income have been used to study the eating behaviour of different meat products. Some of these variables were included in this study and are discussed below.

2.16.1.1 Age

Age has been included as a variable in the studies of factors influencing the consumption of grasscutter meat. Studies (Odebode et al., 2012; GSS, 2013; Dery, 2015) revealed that grasscutter meat is consumed across all ages, thus both young and adults consume grasscutter meat. Despite this revelation, consumption is generally high among the youth because they are still in active service and thus receive frequent income compared to the aged (Adefalu et al. 2012; Saha et al. 2022).

2.16.1.2 Gender

A study by Bower et al. (2003) on the assessment of how dietary habits of liking could affect purchasing traits showed that gender was a significant determinant of WTP purchase intent. Similarly, Nandi et al. (2017) revealed significant results on gender with WTP for organic food products. In the study of goat meat preference and WTP, Mclean-Meyinsse (2003) reported that male's preference for goat meat was higher than females and they were WTP higher prices on average compared to their female counterparts. In the study of Dibb and Fitzpatrick (2014), the result revealed that male consumers eat more and therefore tend to have higher preferences for meat products than female consumers who are more selective (Erasmus et al., 2014) in their purchasing decisions.

2.16.1.3 Education level

Concerning grasscutter meat preference by educational level, Odebode et al. (2012) and (Dery, 2015) reported that grasscutter meat preference was high among consumers with higher educational levels. Studies revealed that consumers' nutritional knowledge has a significant effect on dietary habits and purchasing decisions (Almansour et al., 2020; Baker et al., 2022). Odebode et al. (2012), Wu et al. (2012) and Nandi et al. (2017) also demonstrated that higher educational level influences consumers' WTP premium price for products because people with higher education earn more and can afford commodities at higher prices than those with lower levels of education.

2.16.1.4 Marital status

Marital status has also been used as a variable to correlate with preference and WTP for goods and services. For instance, Amfo and Ali (2021) revealed that married couples are more WTP for upgraded meat standards in Kumasi, Ghana. Nandi et al. (2017) found similar results on gender in their studies.

2.16.5 Household size

Another important attribute that is often used to correlate with preference and WTP for goods and services is household size. While several studies revealed a positive correlation between household size and WTP, other studies showed opposite results. For instance, the study by Nandi et al. (2017) revealed that household number significantly influences consumers' WTP for premium products. That is to say, as household membership increases, the WTP for products increases. However, Acquah (2011) and Quagrains (2006) found opposite results for the same variables. The same

authors reported similar results on the number of dependents and its association with WTP.

2.16.1.6 Income

Income is an important variable for WTP for goods and services. Muzayyanah and Dewi, (2019) reported a positive correlation between income and WTP. In their study, the result showed that consumers who earned higher income were WTP for goods and services compared to consumers with lesser income.

2.17 Empirical Model Equation

The WTP function is represented as: $WTP = \alpha - \rho B + \lambda'Z + \varepsilon$

The model expressed in terms of the probability of purchasing grasscutter meat to a bid amount can be specified as follows: $Pr \{WTP \leq B\} = \Phi(\alpha - \rho B + \lambda'Z)$ where, WTP: the minimum acceptable price discount for grasscutter meat; B: the bid price (in percent discount) offered to grasscutter meat, Z: a set of observable characteristics for consumers, Φ : a cumulative distribution function, α , ρ and λ : unknown parameters ε : a random term. The probability that a given respondent is willing to pay for grasscutter meat is given by;

$$(1) \text{ the YY group, } Pr \{BH \leq WTP\} = 1 - \Phi(\alpha - \rho B + \lambda'Z)$$

$$(2) \text{ the YN group, } Pr \{B \leq WTP \leq BH\} = \Phi(\alpha - \rho BH + \lambda'Z) - \Phi(\alpha - \rho B + \lambda'Z)$$

$$(3) \text{ the NY group, } Pr \{B > WTP \leq BL\} = \Phi(\alpha - \rho B + \lambda'Z) - \Phi(\alpha - \rho BL + \lambda'Z),$$

$$(4) \text{ the NN group, } Pr \{B > WTP\} = \Phi(\alpha - \rho BH + \lambda'Z),$$

Where YY group = Yes, Yes

YN group = Yes, No

NY group = No, Yes

NN group = No, No

Assuming utility maximisation, the log-likelihood function for a sample is obtained by joining the probability of the four outcomes. This takes the following form:

$$\ln L = \sum \{ Id=1 \ln [\Phi(\alpha - \rho B + \lambda'Z)] + Id=2 \ln [\Phi(\alpha - \rho B + \lambda'Z) - \Phi(\alpha - \rho BL + \lambda'Z)] \\ + Id=3 \ln [\Phi(\alpha - \rho BH + \lambda'Z) - \Phi(\alpha - \rho B + \lambda'Z)] + Id=4 \ln [1 - \Phi(\alpha - \rho B + \lambda'Z)] \}$$

where $I_d=1$, $I_d=2$, $I_d=3$ and $I_d=4$ are binary variables with 1 representing the occurrence of that particular result, and 0 otherwise. The parameters are estimated by maximizing the log-likelihood function of the four discrete outcomes as determined by Jerop (2012).

2.18 Contingent Valuation Techniques

CVT is a direct elicitation of respondents' WTP for a change in the quality or quantity of a public good or service. CVT simply involves asking consumers to state the price they are willing to pay for a hypothetical product (Venkatachalam, 2004; OECD, 2018). The elicitation is done either through closed-ended (vote yes or no to one or more bidding offers) or open-ended (maximum amount to pay expressed by respondents) responses in surveys. At the moment, there are four methods of eliciting responses from respondents under CVT. These are the dichotomous approach which is subdivided into single bounded dichotomous choice (take it or leave it) and the double bounded dichotomous choice (take it or leave it with follow-up), the payment card approach, the bidding game approach and the open-ended approach (Venkatachalam, 2004).

2.18.1 Determinants of WTP

Many factors affect consumer preferences and WTP for meat products. Knight et al., (2006) conducted a survey on demographic characteristics and goat meat shopping preferences by goat meat consumers in the United States. The results showed that males were more willing to accept and shop for goat meat than their female counterparts. Also, older adults and those with higher education were more willing to shop for goat meat products. Another study by Mclean-Meyinsse (2003) who used binomial logit and ordered probit models to estimate the relationship between demographic, socioeconomic and geographic factors and the willingness to try goat meat and purchase processed goat products showed that younger persons and households constituting not more than three people were unwilling to try goat meat products. Males were more willing to purchase and try goat meat products than their female counterparts. In studies by Worley et al. (2004), Ibrahim et al. (2008) and Fisher et al. (2009) on goat meat consumption preference, they found that all respondents preferred fresh goat meat over frozen goat meat and were willing to buy fresh products at premium prices

One major reason why we consume food is to ensure that we remain healthy and prolong our lives. Food is therefore primarily consumed by many for the fact that it will offer them the needed health for development (Ashakiran and Deepthi, 2012). Many reports are available in scholarly literature indicating the physical environment as a driver for patronage of food services. Some of these studies include Sohn and Tadisina (2008), Klaus and Maklan (2013) and Okpighe and Ogundare (2020). All these authors established that many consumers patronize food service establishments based on the perceived beliefs they hold about such establishments. Therefore, the physical environment is an important element to consider when establishing a food service outlet. In a study by Inoni et al. (2016) to find out the influence of socio-demographic characteristics on the patronage of fast food in Nigeria, the result of a multiple regression showed that food service quality, monthly income and food quality were statistically significant except for the level of education of respondents. Blesic et al. (2018) also conducted a study among university students to determine the factors influencing students' choice of fast-food restaurants. The results show that the quality of food, appearance, presentation of food, menu-item variety, cleanliness of the restaurant, kitchen, service personnel, nearness and accessibility influenced their choice of fast-food restaurants. Several studies (Tabassum and Rahman, 2012; Acheampong et al., 2017; Owusu and Anifori, 2013; Meeprom et al., 2023) further revealed how the quality of food and nutritional value influenced consumers purchasing decisions. Other factors influencing consumer buying behaviours include price (Huo et al., 2021), aroma (Dery et al., 2015; Teye et al., 2020), the brand name of the foodservice outlet (Ahmad et al., 2013; Song et al., 2019; Mobarak et al., 2022), loyalty to the food service outlet (Soriano, 2002; Dissanayake et al., 2020) and location of the food service outlet (Tabassum and Rahman, 2012), physical surroundings (Ahmad et al., 2013) and texture or softness of meat (O'Quinn et al., 2018; Felderhoff et al., 2020).

Several studies have employed contingent valuation techniques to assess consumers' WTP. For instance, CVT was used by Giotis and Drichoutis (2021) to determine Greek consumers' acceptance and willingness to pay for direct and indirect entomophagy. The results show that the majority of Greek consumers are not willing to pay a premium for an insect-based energy bar and cookie (direct entomophagy) and they would require a discount to acquire such products. Also, a study by Nandi et al. (2017) showed that age, household number, educational level, gender, marital status and family income

influence consumers' WTP premium for products. Other studies on consumers' WTP for a premium price relate to the location and healthiness of the environment (Tabassum and Rahman, 2012), taste (Nandi et al., 2017), food safety (Meeprom et al., 2023), income (Ali and Ali, 2020), appearance (Schubert, 2008; Ghorbani and Hamraz, 2009), price (Huo et al., 2021) and education (Ali and Ali, 2020).

2.18.2 Model for estimating factors influencing WTP for grasscutter meat

Model five shows a regression model involving factors influencing WTP for grasscutter meat (Figure 2.7).

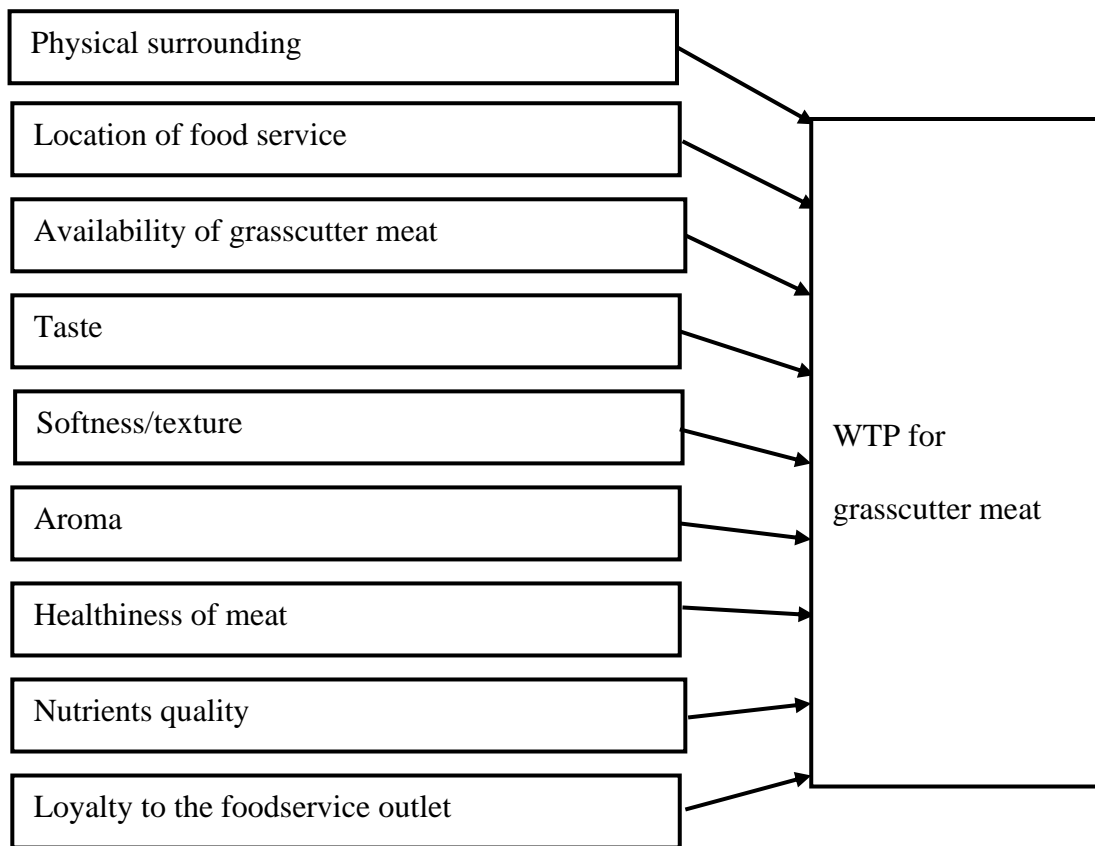


Figure 2.6: Conceptual framework for factors influencing WTP for grasscutter meat

Source: Author's model, 2023.

$$\text{WTP for grasscutter meat: } \beta_0 + \beta_1 \times \text{physical surrounding} + \beta_2 \times \text{location of food service} + \beta_3 \times \text{Availability of grasscutter meat} + \beta_4 \times \text{Taste} + \beta_5 \times \text{Softness/texture} + \beta_6 \times \text{Aroma} + \beta_7 \times \text{Healthiness of grasscutter meat} + \beta_8 \times \text{Nutrients quality} + \beta_9 \times \text{Loyalty to the food service} + \beta_{10} \times \text{Choice cuts} + \beta_{11} \times \text{Processing/preservation method} + \epsilon \text{ (5) Equation 2.5.}$$

Table 2.3: Operationalisation of independent variables on dependent variables (WTP for grasscutter meat) for regression analysis

Explanatory variable	Description of variable	Measurement	Slope of coefficient	Apriori
Physical surrounding	The physical environment where food is served	Binary	β_1	+/-
Location of food service	Geographical location of the food outlet	Binary	B2	+/-
Availability of grasscutter meat	Frequency of grasscutter meat included in the meal the service	Binary	B3	+/-
Taste	Taste of grasscutter meat	Binary	B4	+/-
Softness/texture	How tender the meat is	Binary	B5	+/-
Aroma	The smell of grasscutter meat	Binary	B6	+/-
Healthiness of grasscutter meat	The healthiness of grasscutter meat	Binary	B7	+/-
Nutrients quality	The quality of nutrients in the grasscutter meat	Binary	B8	+/-
Loyalty to the food service	How loyal consumers are to the food service outlet	Binary	B9	+/-
Choice cuts	Preferred portion cuts of grasscutter meat	Binary	B10	+/-
Processing/preservation method	Preferred processing and preservation method for grasscutter meat	Binary	B15	+/-

2.18.3 Models for estimating the relationship between WTP and bid levels for grasscutter meat

Models six, seven eight and nine show regression models involving socio-economic characteristics and bid levels (Figure 2.8).

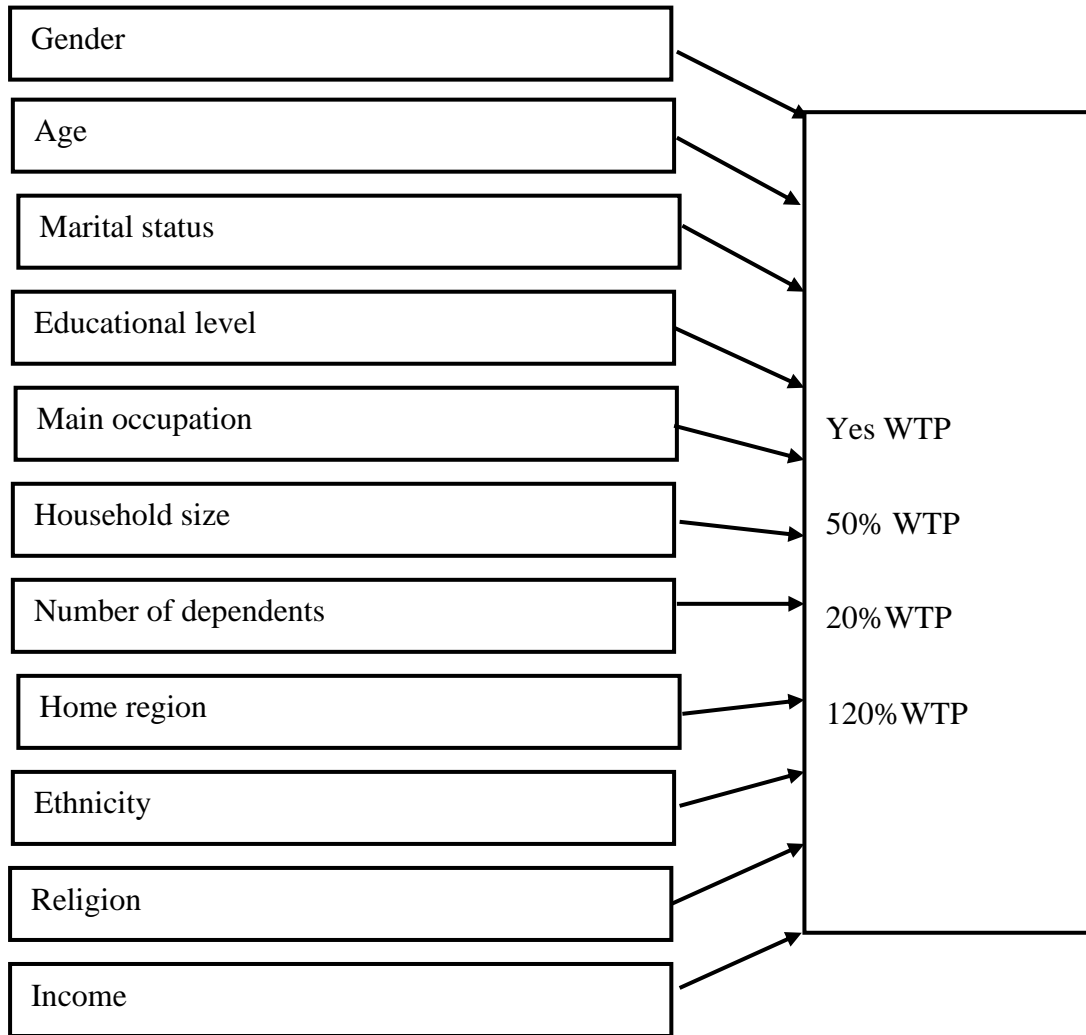


Figure 2.7: Conceptual framework for estimating the relationship between WTP and bid levels for grasscutter meat

$$WTP = \beta_0 + \beta_1 \times \text{Gender} + \beta_2 \times \text{Age} + \beta_3 \times \text{Marital status} + \beta_4 \times \text{Education} + \beta_5 \times \text{Main occupation} + \beta_6 \times \text{Household size} + \beta_7 \times \text{Dependents} + \beta_8 \times \text{Religion} + \beta_9 \times \text{Income} + \text{eit} \quad (6) \dots \dots \dots \text{Equation 2.6}$$

$$50\% \text{ WTP} = \beta_0 + \beta_1 \times \text{Gender} + \beta_2 \times \text{Age} + \beta_3 \times \text{Marital status} + \beta_4 \times \text{Education} + \beta_5 \times \text{Main occupation} + \beta_6 \times \text{Household size} + \beta_7 \times \text{Dependents} + \beta_8 \times \text{Religion} + \beta_9 \times \text{Income} + \epsilon \quad (7) \dots\dots\dots \text{Equation 2.7.}$$

$$20\% \text{ WTP} = \beta_0 + \beta_1 \times \text{Gender} + \beta_2 \times \text{Age} + \beta_3 \times \text{Marital status} + \beta_4 \times \text{Education} + \beta_5 \times \text{Main occupation} + \beta_6 \times \text{Household size} + \beta_7 \times \text{Dependents} + \beta_8 \times \text{Religion} + \beta_9 \times \text{Income} + \epsilon \quad (8) \dots\dots\dots \text{Equation 2.8.}$$

$$120\% \text{ WTP} = \beta_0 + \beta_1 \times \text{Gender} + \beta_2 \times \text{Age} + \beta_3 \times \text{Marital status} + \beta_4 \times \text{Education} + \beta_5 \times \text{Main occupation} + \beta_6 \times \text{Household size} + \beta_7 \times \text{Dependents} + \beta_8 \times \text{Religion} + \beta_9 \times \text{Income} + \epsilon \quad (9) \dots\dots\dots \text{Equation 2.9.}$$

Table 2.4: Operationalisation of independent variables on dependent variables (WTP and bid levels) for regression analysis

Explanatory variable	Description of variable	Measurement	Slope of coefficient	Apriori
Gender	Gender of respondents	Categorical	β_1	+/-
Age	The age group of respondents	Continuous	B2	+/-
Marital status	Marital status of the respondents	Categorical	B3	+/-
Education	The educational level of respondents	Categorical	B4	+/-
Main occupation	The main work of the respondents	Categorical	B5	+/-
Household size	Number in a household	Continuous	B6	+/-
Dependents	Number of dependents	Continuous	B7	+/-
Religion	Religion of respondents	Categorical	B10	+/-
Income	Earnings of respondents	Categorical	B11	+

2.18.4 Models for estimating factors influencing consumers' preferences for choice cuts and processing/preservation methods for grasscutter meat

Models ten and eleven show regression models involving socio-economic characteristics and preferences for choice cuts and processing/preservation methods for grasscutter meat.

Choice cuts: $\beta_0 + \beta_1 \times \text{Gender} + \beta_2 \times \text{Age} + \beta_3 \times \text{Marital status} + \beta_4 \times \text{Education} + \beta_5 \times \text{Main occupation} + \beta_6 \times \text{Household size} + \beta_7 \times \text{Dependents} + \beta_8 \times \text{Home region} + \beta_9 \times \text{Ethnicity} + \beta_{10} \times \text{Religion} + \beta_{11} \times \text{Income} + \epsilon_{it}$ (10) Equation 2.10.

Processing/preservation method: $\beta_0 + \beta_1 \times \text{Gender} + \beta_2 \times \text{Age} + \beta_3 \times \text{Marital status} + \beta_4 \times \text{Education} + \beta_5 \times \text{Main occupation} + \beta_6 \times \text{Household size} + \beta_7 \times \text{Dependents} + \beta_8 \times \text{Home region} + \beta_9 \times \text{Ethnicity} + \beta_{10} \times \text{Religion} + \beta_{11} \times \text{Income} + \epsilon_{it}$ (11) Equation 2.11.

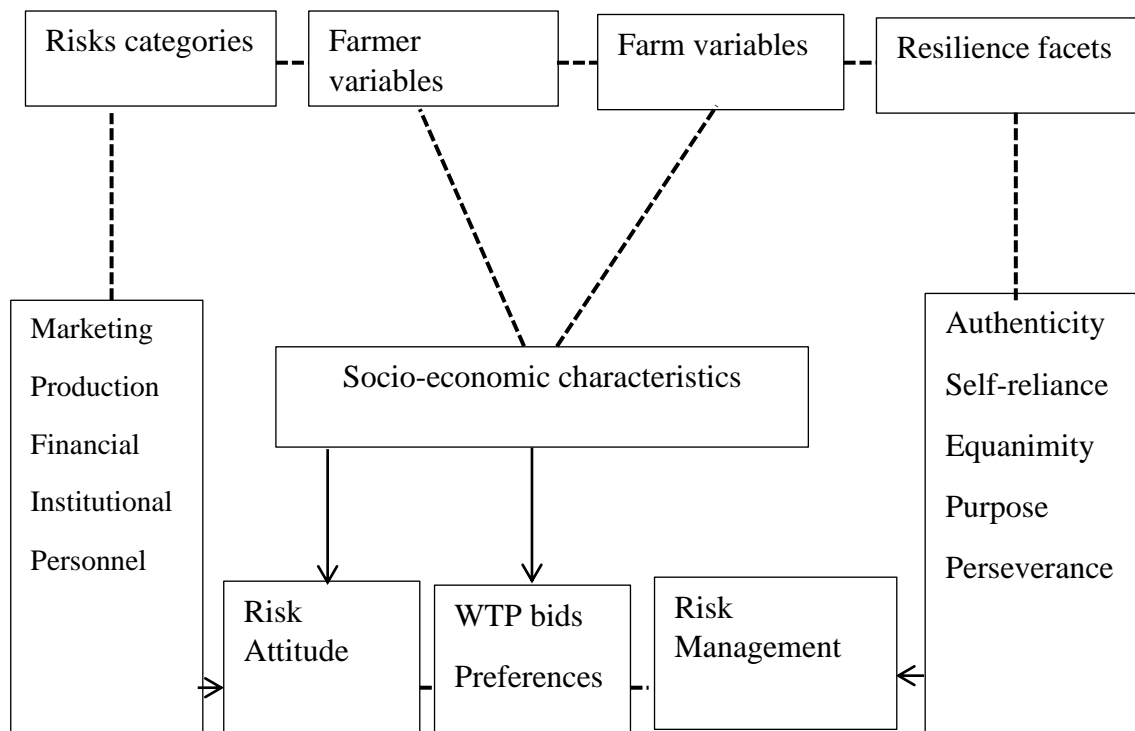


Figure 2.8: Conceptual Framework for the Study

Source: Author's Construct, 2023

2.19 Principal Component Analysis (PCA)

PCA is a data reduction technique that is used in a broad field of research. The feasibility of PCA is determined by three values. These include KMO, MSA and

Bartlett Test. The KMO measure of sampling adequacy is a test statistic that is used to determine if the sample size is big enough for factor analysis. It ranges from 0 to 1. The KMO with more than 0.50 should be sufficient for factor analysis Hamza et al. (2019). The maximum value of KMO is 1 and its value of 0.90 is considered 'Excellent', 0.80 is 'good', 0.70 is 'moderate' and 0.60 is 'poor' Juahir et al. (2017). Several criteria are used to determine the number of common factors to retain. The first one is the Kaiser criterion which states that the number of eigene values of the correlation matrix should be greater than one. That is all factors with values more than one should be retained while those less than one should be dropped (Kaizer, 1960). The second criterion is the scree plot of the eigene values. Cattell (1966) stated that all factors after the curve of the plot should be dropped because they do not contribute significantly to the model. Therefore, all factors above the curve should be retained because they contribute greatly to the model. The other criteria are the variance explained and commonalities (Filed, 2013). This variance and correlation between common factors are usually expressed in the component's loadings (Eze et al., 2021). In the study of Dogbegah et al. (2011), the authors stated that if the proportion of variance explained by the components is more than 50%, then those factors should be retained to represent the data in the model.

2.20 Chapter Summary

The Chapter provides an empirical review of the concept, theories and model applications relevant to the study. It relates the theoretical underpinnings and the concepts of risk attitude, risk management and risk resilience of grasscutter farmers, as well as the relevant theory and models on determinants of preferences and WTP for grasscutter meat.

CHAPTER THREE

STUDY AREA AND METHODOLOGY

3.1 Introduction

This chapter discusses and justifies the pragmatic philosophical worldview and the mixed-method research approaches used during the data elicitation and analysis stages. The Chapter justifies the choice of research areas and respondents' sample. The study methods are discussed under research design and research approach, including the research purpose.

3.2 Study Area

3.2.1 The Study Context

The study area is the Upper West Region of Ghana. The Upper West region is located within latitude 9.8°- 11.0° North and longitude 1.6°- 3.0° West. Burkina Faso borders it to the north and west, Upper East and Northern regions to the east, and the Northern region to the south.

Grasscutter farming was introduced in the Upper West region in 2014 by the Ghana Grasscutter Project under the theme 'enhancing rural livelihoods through the production of native livestock'. To continue with the success of the project, GIFT, a non-profit local organisation was formed and has been championing grasscutter production in the region. The overarching goal of GIFT is to empower local communities through efficient education for nutrient supply, environmental conservation and grasscutter keeping as an additional source of income. Some of the activities ongoing successfully include women empowerment through grasscutter rearing and meat processing, nutrition and environmental conservation education for women and school children in the region. Several workshops have also been organised to train farmers on grasscutter husbandry practices. The region was therefore chosen because of the huge investment that the grasscutter industry has received from both local and international organisations to reduce poverty and improve the nutrition situation of households. Some international NGOs supporting grasscutter production in the Upper West region include JICA, AIN, KAKENHI, JSPS Bilateral Joint Research Projects/Seminars all in Japan and Innovate UK Agri-tech Catalyst in the United Kingdom. Again, several collaborative research institutions support and research

grasscutters in the region. These include the University of Ghana, Legon, Kyoto University, Gifu University, Kagawa University, National Institute of Genetics, and Chubu University all in Japan and the University of Edinburgh in Scotland, United Kingdom.

Through support and research, the following initiatives have been achieved by GiFT:

- i. An established modern selective breeding programme at the University of Ghana to improve the quality of breed stock provided to grasscutter farmers in the region;
- ii. A network of farmers trained in grasscutter production and meat processing in the Upper West region; and
- iii. Grasscutter farm enterprises staffed by women trained in small business management and grasscutter cooperatives to support marketing and product development.



Plate 3.1: Modern grasscutter breeding centre in the University of Ghana, Legon

Source: GiFT, 2021; 2022

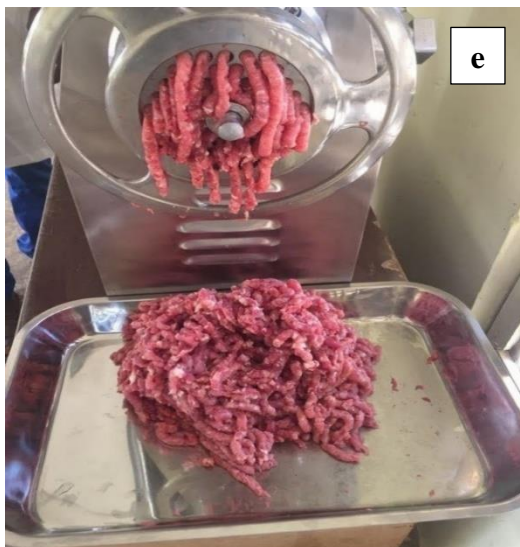


Plate 3.2: A network of farmers trained in grasscutter production and meat processing at the Regional MofA Office, Wa.

Source: The Author, 2021.

Grasscutter farmers undergoing grasscutter husbandry training, Wa (a); the author delivering a lecture on meat processing (b) and demonstrating the use of processing equipment to farmers (c), Wa; processed canned grasscutter meat made by farmers, Wa (e); extruded grasscutter meat for sausage making by farmers, Wa (f).



Plate 3.3: Grasscutter farm enterprises staffed by women trained in small business management and grasscutter cooperatives to support marketing and product development

Source: GIFT, 2019.

Also, the Upper West region is the poorest in the country in terms of food security (WFP, 2013). In this area, there is insufficient livestock production to provide affordable protein to the poorest households resulting in an unsustainable reliance on wild meat hunting to supplement diet. In addition to having a higher protein content by weight than existing domestic livestock, grasscutters are raised in purpose-built cages requiring little land and consumption of grass, alleviating competition for higher-value grain (Adenyo et al., 2020).

Additionally, there are distinct roles for men and women in rural agriculture in Ghana. Unlike most livestock species, grasscutter can be managed by women as well as men, providing scope for involving women in grasscutter farming and production (GIFT, 2021). Women dominate the grasscutter wholesale trade and are prioritised by GIFT, which works with women groups to stimulate the rural economy. The study location is therefore an ideal choice to explore how these organised grasscutter farmers experience

risk, manage and survive risks (Figure 3.1). The study also examined consumers' preferences and WTP price premiums for grasscutter meat in restaurants and chop bars in the Wa Municipality (Figure 3.2).

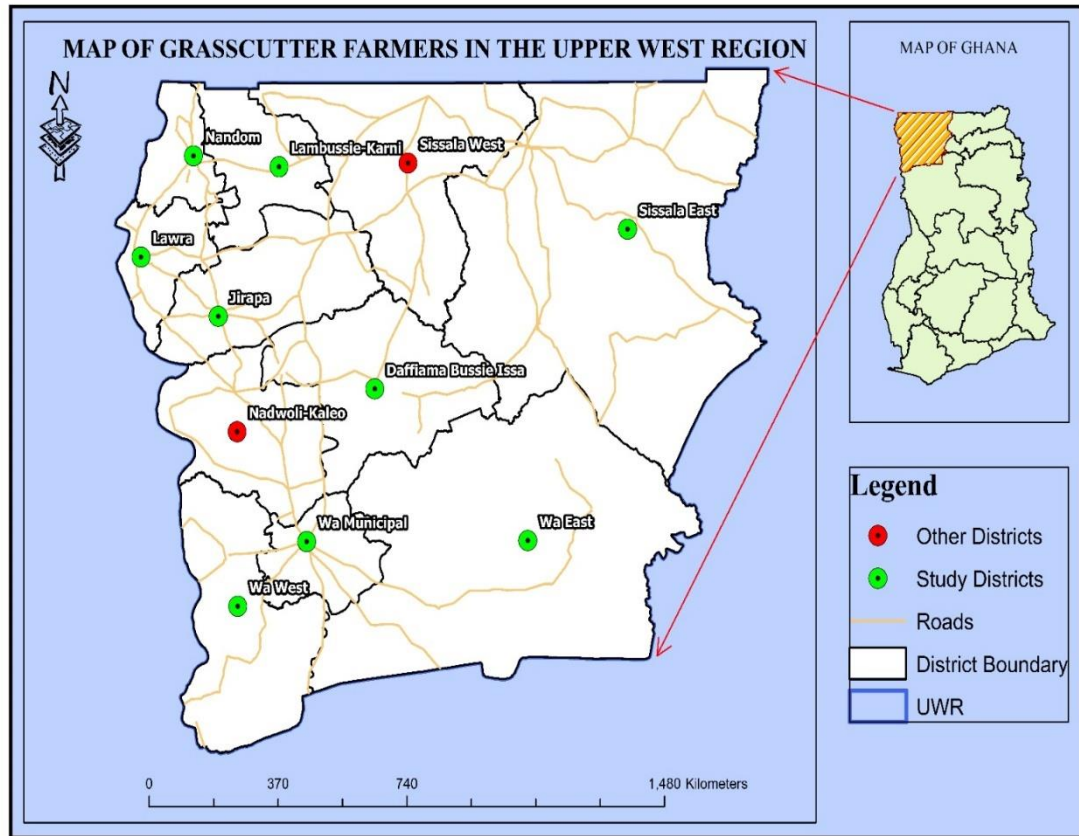


Figure 3.1: Map of Upper West region showing District locations of grasscutter farmers

Source: The Author, 2022.

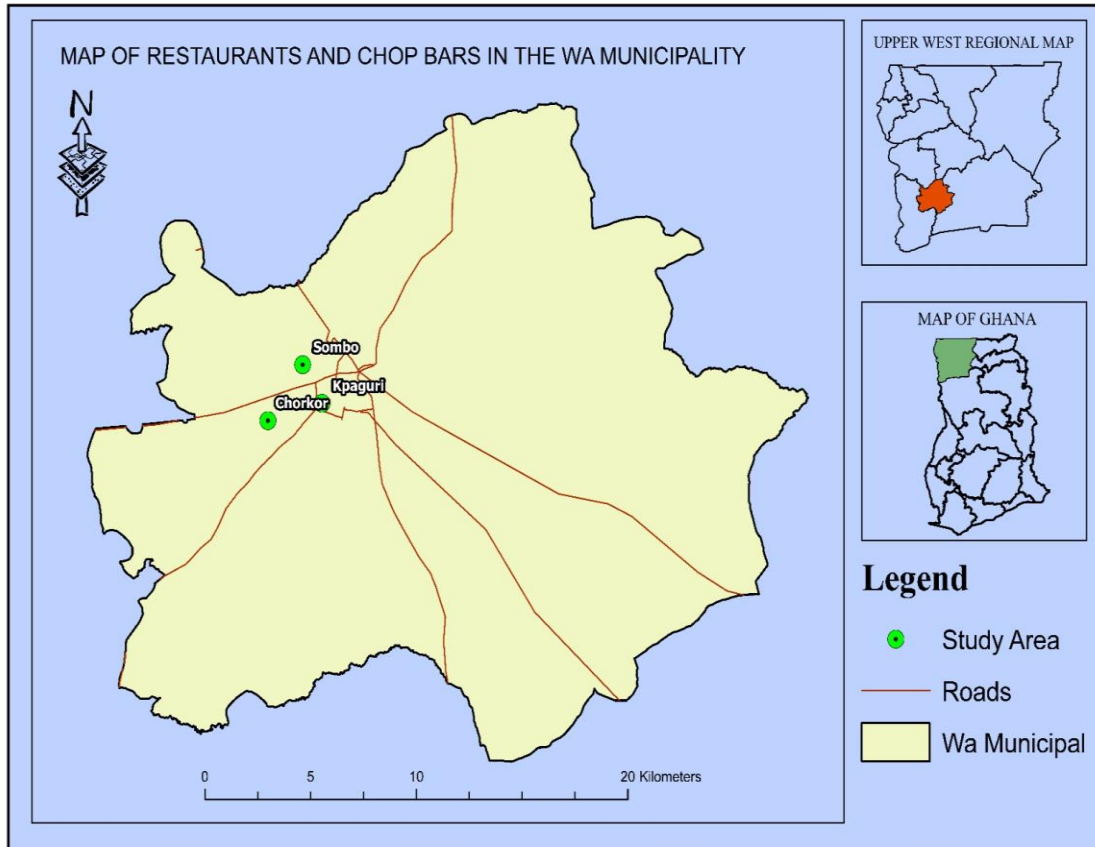


Figure 3.2: Map of Wa Municipality showing Communities where Chop Bars and Restaurants incorporate Bushmeat in their Meal Preparation.

Source: The Author, 2022.

3.2.2 Physical characteristics

The Upper West Region covers a land area of 18,476 km² representing 7.8% of the total land area of Ghana (Ghana Statistical Service (GSS), 2012). As one of the five regions located in the northern part of Ghana, rainfall is unimodal which starts in May and ends in October every year unlike regions in southern Ghana that experience bimodal rainfall. Belonging to the Guinea Savannah zone, the vegetation consists of broadly spaced shrubs with fire and drought-resistant trees. The soil surface is characterised by different species of grasses majority of which belong to the family of poaceae that get burned during the dry season (Dery et al., 2020). This causes severe cold commonly called harmattan winds between November and February as a result of the northeast trade winds (easterlies). The region is blessed with many tourist sites such as the Wechiau Hippopotamus Sanctuary and Nakore Ancient Mosque located in Wa West District, the Gwollu Slave Defense Wall and Gbelle Game Reserve located in the

Sissala West District, The Wa Naa's Palace in Wa Municipal, the Mushroom Rock in Lawra Municipality, a Slave Market in Nandowli District among others which bring about rural development and improvement in the livelihood of the inhabitants through various trading activities in these sites.

3.2.3 Population

There are eleven administrative districts with the 2021 Population and Housing Census (PHC) regional total population of nine hundred four thousand, six hundred and ninety-five (904,695) which is 2.9% of the national population (GSS, 2021). The 2021 PHC shows that the annual intercensal regional growth rate is 2.3 with 48.8% of the population being males while 51.2% are females. About 50.8% of the regional population are aged twenty years and above while 49.2% are aged below twenty years. The districts' populations are not proportionally distributed. The districts population distribution shows 22.3% in Wa Municipality, 6.5% in the Lawra Municipal, 8.5% in the Nandowli-Kaleo District, 4.3% in the Daffiamah-Bussie-Issah District, 10.1% in the Jirapa Municipal, 10.8% in the Wa West District, 10.1% in the Wa East District, 8.9% in the Sissala East Municipal, 5.7% in the Lambussie-Karni District, 5.7% in the Nandom Municipal and 7.1% in the Sissala West District (GSS, 2021).

3.2.4 Economic characteristics

Agriculture is the major economic activity involving 72.0% of the population (GoG/UNICEF, 2013). Many food crops such as cereal and grains [maize (*Zea mays*), millet (*Pennisetum glaucum*), sorghum (*Sorghum bicolor*) and rice (*Oryza sativa*)], legumes [cowpea (*Vigna unguiculata*), groundnuts (*Arachis hypogaea*), bambara beans (*Vigna subterranean*)], root and tubers [yam (*Dioscorea sp.*), cassava (*Manihot esculenta*), potatoes (*Solanum tuberosum*)] and vegetables [pepper (*Capsicum sp.*), pumpkin (*Cucurbita sp.*), kenaf (*Hibiscus cannabidis*), okra (*Abelmoschus esculentus*)] are commonly cultivated (Dery et al., 2020). Additionally, trees such as dawadawa (*Parkia biglobosa*), baobab (*Adansonia sp.*), rosewood (*Aniba rosaedora*), neem (*Azadirachta indica*), mango (*Mangifera indica*) and shea (*Vitellaria paradoxa*) are common and their trunks, leaves and fruits serve as sources of households' livelihoods either by direct consumption or sales for income. All the crops are rain-fed between May and October. There is therefore an extended dry season of six months from November to April. Livestock that are reared by many households are poultry, goats, cattle, sheep and goats which are mainly kept under an extensive system. Fishing is also

practised as an economic activity especially between November and March in rivers and the Black Volta Lake by using either fish traps, hook and line, fishing boats or evacuating the water. Some tourist sites provide economic benefits for the people. The crops and livestock produced are for both consumption and sale. The local markets serve as major trading places for crops and livestock. Also, traditional craftworks including smock weaving, pottery, basketry, xylophone, thatch roof and wood carving form part of the local economy of households in the Region. Trading is done in ethnically heterogeneous marketplaces. Three dominant languages are spoken. These are Dagaare, Waali and Sissala with each language having several dialects.

3.3 Methodology

The research methodology is one of the most important parts of a research work. It ensures that the researcher carries out the study in a highly successful manner so that accurate data can be obtained to answer the research questions. Research methodology is chosen based on an established theory that relates to the research objectives. The methodology encompasses the type of research being conducted, how the data is collected, analysed and presented and the area covered by the study among others. The elements of research methodology are outlined below.

3.3.1 Research philosophy

Creswell & Cresswell (2018) described ontology as “the study of being”. It concerns “what kind of world we are investigating in the view of nature of presence and the structure of reality”. Guba and Lincoln (1989) state that ontological presumptions are those that react to the question ‘What is there that can be known?’ or ‘What is the nature of reality?’ In the field of ontology, knowledge is the persistent questioning of the existence of reality. Both ontological and epistemological perspectives concern what is commonly alluded to as a person's worldview which has a critical impact on the perceived relative importance of the viewpoints of reality (Scotland, 2012). Epistemology is the process of obtaining knowledge. Epistemology as a specialised term in logic alludes to how we know and the relationship between the knower and the known (Scotland, 2012). The epistemology on the quantitative aspect of this study is built on the careful measurement and quantification of variables, the distinction between the knower and the known, objective reality out there irrespective of the knower's knowledge, a critical reality accepting fallibility in knowing and the

expression of their relationships statistically. Here, percentages, frequencies, correlation, regression, means and other important variables form the analytical base on the responses to understand them objectively in numerical terms. The study seeks to bring an understanding of the various causal relationships among variables Creswell and Creswell, 2018). The key approach for this study's qualitative component was constructivism which allows respondents the freedom to share their thoughts and experiences on the topic while recognizing the reflective influence of my interpretation as a researcher.

3.3.2 Research design

A research design is a conceptual structure or plan that shows how a study will be carried out (Leavy, 2017). It outlines how one proposes to conduct the research. It is the coherent grouping in which the research is to be carried out as well as the components to think about. It incorporates methods of data collection and analysis and all administrative strategies that ought to be considered for the study to be carried out without issues or delay (Sileyew, 2020). A research design enables us to arrive at the research objectives, answer the research questions, outline the methods and procedures to get data to analyse for the needed information required of the research and help us address key issues of the research such as validity, reliability and generalizability of the findings (Sileyew, 2020). The design for this study was a cross-sectional survey. A cross-sectional survey entails observation of a subset of a population, describes the current nature and conditions that exist, studies the relationship between different variables at a single point in time and shows how variables affect each other (Setia, 2016).

3.3.3 Research approach

One critical issue that needs to be considered by a researcher during the research planning stage is to carefully understand the philosophical worldview and assumptions of the study (Creswell & Cresswell, 2018; Dawadi et al., 2021). The worldview and assumptions will help the researcher to decide on the research design and the particular methods that will guide the approach into practice. Researchers describe the worldview of the researcher as paradigms (Almalki, 2016; Creswell & Cresswell, 2018). The most widely used worldviews by researchers are constructivism, positivism and pragmatism (Almalki, 2016; Cresswell & Creswell, 2018; Dawadi et al., 2021). In this study, the pragmatists' worldview is adopted. Saunders et al. (2009) and Creswell & Cresswell

(2018) described the pragmatist worldview as conducting research using both quantitative and qualitative approaches. Hence the research questions for this study were addressed within the framework of positivism, constructivism and interpretivism. The mixed method approach allows the researcher to do both subjective and objective analysis of the research findings from the data as well as allows a descriptive and statistical presentation of the research findings. While the quantitative aspect of the study is based on how causes determine effects or outcomes as a single truth (Creswell & Creswell, 2018; Dawadi et al., 2021), the qualitative aspect addresses multiple truths among respondents.

3.3.4 Research purpose

The purpose of this study is based on explanatory sequential design. Explanatory sequential design research is best fit when the researcher intends to analyse quantitative data and then use the qualitative data to explain the initial quantitative results (Cresswell & Clark, 2011). The quantitative data present cause-and-effect relationships, associations or correlations between variables (Leavy, 2017). It helps researchers to explain phenomena, enables them to understand exactly what they are looking at and helps build, test or revise a theory (Cresswell & Clark, 2011). The study explained and showed evidence of how farmers and farm variables affect or influence observed variables such as the risk-taking experience of grasscutter farmers, risk control and how they bring about resilience as part of their management strategies. Additionally, the study showed the determinants of WTP and consumers' preferences for grasscutter meat. The qualitative data presented interpretations on expressions of unsuccessful grasscutter farmers as well as MoFA officials supporting grasscutter production in the UWR.

3.3.5 Sources of data

The study used both primary and secondary data. The primary data was collected using the questionnaire designed for this study. The primary data was collected through field trips to the study locations where the questionnaire was administered to grasscutter farmers selected for this study. The data collected include farm characteristics, farmer characteristics, risk attitude and risks management. The data collected from consumers include consumers' WTP price premiums for grasscutter meat, determinants of WTP for grasscutter meat and preferences for grasscutter meat. Also, key informant interviews were conducted with unsuccessful grasscutter farmers and MoFA officials.

The key informant interview guide contained questions on knowledge of livestock production, institutional support for livestock (and grasscutter) production in the district, problems confronting livestock and grasscutter production, grasscutter information dissemination and perceived risks of grasscutter production. The study results were discussed in relation to published scholarly articles, books, media materials and other unpublished materials that are relevant to this study.

3.3.6 Target population

The target population for this study included all grasscutter farmers managed by GIFT in the UWR of Ghana and consumers of grasscutter meat. Also, fifteen unsuccessful grasscutter farmers and ten MoFA officials in the UWR who have been supporting grasscutter production activities were interviewed to obtain qualitative data. Also, the study covered consumers of grasscutter meat at food service establishments in the Wa Municipality.

3.3.7 Sample size and sampling techniques

The sample frame for the risk attitude and management constituted all 52 grasscutter farmers managed by GIFT that were still in production in the Upper West region. There was no sample size calculation as the study adopted the census method. Thus, the study covered all the grasscutter farmers since the population size was not too large.

For the consumer survey, a multistage sampling technique was used. Firstly, Wa which is one of the five zonal councils (Wa, Kperisi, Busa, Boli and Kpongo) in the Wa Municipality where foodservice outlets such as restaurants and chop bars are more common was purposively selected for this study. Secondly, three communities (Chorkor, Wa-Sombo and Kpaguri) within the Wa zonal council were purposively selected due to the many restaurants and chop bars operating in these areas. Thirdly, two restaurants or chop bars that incorporate bushmeat into their meal services (Bangfodeme, Bush canteen, Royal Gardens, Hippo Bar, Judith lite, Amanda, Juaboso etc) were selected randomly using a simple ballot method from the three locations giving a total of six restaurants and chop bars for data collection. The consumer population size and daily patronage for these foodservice outlets cannot be predicted (infinite population). Hence Freneund and William's formular for determining a sample size from an infinite population which has been used by Nnenna (2016) was adopted as shown below:

$$\text{Sample size (n)} = (Z_{\alpha/2})^2 PQ / e^2$$

Where P = Probability for positive response. Q = Probability for negative response. e = Tolerable error (0.05) $Z_{\alpha/2} = 1.96$ from the critical table Z of 0.05 under infinity $\alpha = 0.05$, the significant level and n = Sample size.

Applying this formula to the present study, the sample size (n) of 246 was obtained as follows.

$$n = (Z_{\alpha/2})^2 PQ/e^2$$

$(1.96)^2 (0.8)(0.2)/(0.05)^2 = 245.86 = 246$. The above means that due to the infinite nature of the population, a minimum of 246 respondents is methodically adequate as the sample size. This number was distributed equally for each of the six foodservice outlets. Hence, 41 respondents were interviewed from each food service outlet. The data was cleaned to two hundred and forty-one respondents for analysis. The questionnaire was pre-tested on ten consumers in one food service outlet outside the six selected food service joints but that has similar characteristics in the selected food service joints in the Municipality for content validity and reliability checking before actual data collection.

3.3.8 Data collection tools and techniques

Unstructured and structured questionnaires were developed. The unstructured questionnaire was used for in-depth interviews with unsuccessful grasscutter farmers and MoFA livestock officers. Information gathered includes knowledge of livestock production, institutional support for livestock (and grasscutter) production in the district, problems confronting livestock and grasscutter production, grasscutter information dissemination and perceived risks of grasscutter production. The tools used for the qualitative data were the interview guide, audio recorder, camera and phones. A structured questionnaire, put in KoboToolbox collect software, was used to administer the questions by the face-to-face (FTF) interview method. The researcher together with a trained assistant with a master's in Community development from SDD-UBIDS collected the data. Whenever the phone's battery was low, responses were written on the printed questionnaire and later put into the software. The FTF method permitted the researcher to explain the questions in the local dialect to the respondents. This procedure is appropriate for illiterate farmers so that they can understand the questions and answer them correctly. Also, the FTF method encouraged the farmers to answer all questions which might not have been answered by other methods of administration.

Hence, the FTF administration gave higher responses. The questionnaire included questions on the demographics of respondents, economic activities involving livestock and crop production, attitudinal items on production, marketing, personal, human and institutional risk sources experienced by grasscutter farmers, attitudinal statements on grasscutter risk management responses, grasscutter farmers' degree of concern on risks affecting the continued operation of grasscutter business and ratings on the importance of risk sources concerning their grasscutter business. For the key informant interviews, both FTF, telephone interviews and community walk observations were used to gather data to validate opinions on the subject matter. The community walk observation was to observe the farmhouses and other socio-economic activities of farmers. The questionnaire on the consumer survey included WTP price premiums, determinants of WTP and preferences for grasscutter meat. A pilot survey was conducted to reveal the mean current price of bushmeat sold in chop bars and restaurants and was used as the start-up price (bid A). If he/ she accepted, then he or she was offered a second, higher bid (A higher); but should he/she reject the initial bid (bid A), a second bid was then offered which was a lower bid (A lower). The possible outcomes are (1) "yes-yes", (2) "no-yes", (3) "yes-no" (4) and "no-no" responses. Figure 3.2 shows the CVT elicitation approach for WTP for grasscutter meat.

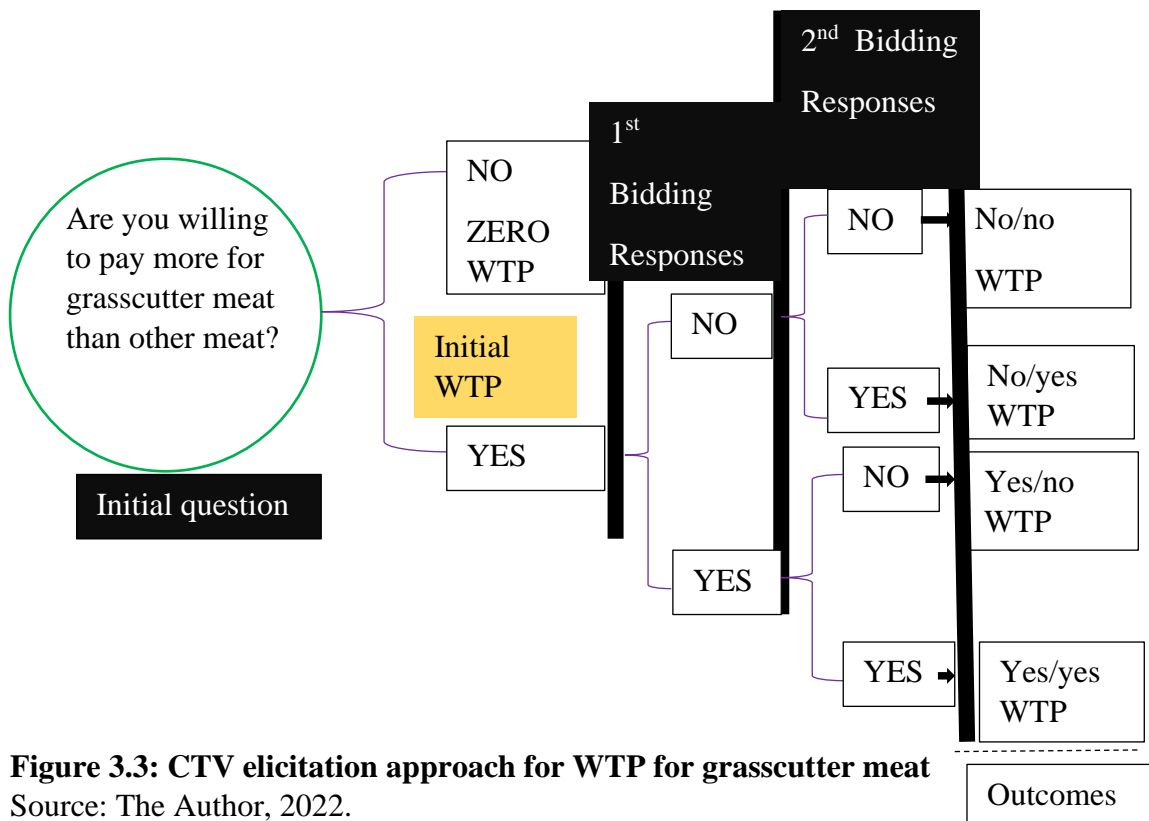


Figure 3.3: CTV elicitation approach for WTP for grasscutter meat
Source: The Author, 2022.

3.3.9 Data analysis and framework

Microsoft Excel version 13 for Windows was used to import and clean data and exported to Stata 14 software for analyses for quantitative data analysis. The qualitative data was analysed using Nvivo version 12. The analytical methods included measures of central tendency, measures of dispersion and regression analysis. Frequencies were computed for categorical variables and presented in tables or figures. Graphs were created using both Microsoft Excel version 13 and Stata 14. Where the variables were ordinal, median or means were calculated based on specific objectives suitable for each and presented in tables or figures.

For objective one, the dependent variable for analysing the risk-taking experience or risk attitude of grasscutter farmers included the risk attitude scale latent construct (RA scale) and the independent variables were marketing risk, personnel or human resource risks, production risks, institutional risks and financial risks. Both dependent and independent variables were ordinal. Since the sample size was less than a hundred, a Shapiro-Wilk test was done to determine the normality of the dependent variable for regression tests. The result shows that the dependent variable was statistically significant indicating the non-normality of data distribution. Ordinal logistic regression was therefore used in the analysis because it is suitable for non-parametric tests such as ordinal dependent variables. Both bivariate and multivariate ordinal regressions were performed and results were reported in crude odd ratios (COR) and adjusted odd ratios (AOR) at a 5% level of significance. The dependent variable for analysing the association between risk attitude and farm and farmer variables was the risk attitude scale construct. The farm variables were the farm size, general farm income, off-farm job, main source of finance and grasscutter sales. The farmers' variables collected were the gender of the farmer, experience or years of rearing grasscutters, age, number of dependents, household size, primary occupation, marital status, educational experience, religion, ethnicity and region. Since the variables were categorical, one category for each variable was made the reference variable to enable comparison with the other variables. Ordinal logistic regression analysis was performed and the result was reported in coefficients (coef.) with corresponding standard errors (St. err.) and t-values. Also, thirty risk concerns were presented to farmers to rank as 1 = not concerned, 2 = slightly concerned, 3 = somewhat concerned, 4 = very concerned and 5 = not relevant. Percentages were calculated for each risk to provide the proportion of

cases that fall into each category relative to the total number of cases to enable understanding of the distribution and relationships within the data and to intuitively understand more of farmers' risk concerns. Also, these risks were calculated into means and ranked to reveal the average level of concern for each risk to the farmer. For the risk management strategies used by grasscutter farmers, thirty-one management strategies were presented to farmers to rank on a scale of 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree and 6 = not relevant. The result was presented in means and ranked to reveal the average level of risk management of grasscutter farmers.

Objective two was to analyse the risk resilience of grasscutter farmers as part of their management. The dependent variable was the risk management scale latent construct (RM scale). The fourteen-item resilience scale grouped into five facet resilience items as used in previous studies was adopted with modification to represent the explanatory variables. Instead of a seven-point Likert scale as used in previous studies, a five-point Likert scale was used in this study. Farmers were asked to rank each item on a scale of 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree. Both dependent and independent variables were ordinal. The variables were transformed into means for each resilience item. Shapiro Wilk test was done to determine the normality of the dependent variable for regression tests. The result shows that the dependent variable was statistically significant indicating the non-normality of data distribution. Ordinal logistic regression was therefore used in the analysis because it is suitable for non-parametric tests such as ordinal variables. Bivariate and multivariate analyses were performed and results reported in both COR and AOR at a 5.0 % level of significance.

Objective three was to determine the factors influencing WTP for grasscutter meat. Firstly, a binary regression analysis was performed to determine the relationship between WTP which was a binary variable with 1 = yes and 2 = no and explanatory binary variables namely physical surroundings, location of food service, availability of grasscutter meat, taste, softness or texture, aroma, the loyalty of the food service, healthiness of grasscutter meat, nutrients quality. Bivariate and multivariate analyses were performed and result the reported in both COR and AOR at a 5.0 % level of significance. Variables that were used in the multivariate analysis were those with p-value ≤ 0.4 from the bivariate results as a criterion for this study to minimize the inclusion of many non-significant variables in the interaction. Also, binary logistic

regression was used to determine the association between WTP, bid levels and selected socio-economic variables. This method was chosen because the dependent variable for each bid level was binary. The socio-economic independent variables used for the binary regression were age, gender, educational level, primary occupation, marital status, number of dependents, household size, religion, ethnicity, home region and monthly income. The results were reported in coefficients for each explanatory variable. To analyze consumers' preference for choice cuts, cooking and processing methods for grasscutter meat. Principal Components Analysis (PCA) analysis was done to reveal two main variables for the preference analysis. Fifteen variables were used for the questionnaire administration in this study. However, nine of the variables were dropped due to cross-loading issues. Hence five variables were used for the PCA analysis. These variables were 'live grasscutter, 'only the head', the innards' grouped as 'choice cuts' preference, and 'canning' and 'vacuum packing' grouped as 'processing/preservation method' preference for grasscutter meat. So, the dependent variables were the live grasscutter, only the head of the grasscutter, only the innards, canning and vacuum packing. These were ordinal with 1 = low preference, 2 = medium preference and 3 = high preference. The independent variables were farm size, general farm income, off-farm job, the main source of finance and grasscutter sales, gender, of farmer, experience or years of rearing grasscutters, age, number of dependents, household size, primary occupation, marital status, educational experience, religion, ethnicity and region. Among, these variables, age, number of dependents and household size were continuous. For the categorical variables, one category for each variable was made the reference variable to enable comparison with the other variables. Due to the ordered nature of the dependent variables, probit ordered logistic regression analysis was performed and the results were reported in coefficients for interpretation.

Objective four was based on qualitative data which was to determine reasons that led to some of the farmers folding up and to determine the effectiveness of institutional support and policies for other livestock and grasscutter production. Two separate qualitative data were collected. One from farmers who folded up in the grasscutter business managed by GIFT (15 farmers) and the other one from MoFA livestock officers (10 officers) in the region. An interview guide was designed based on a review of the literature surrounding farmers' opinions on their knowledge of agricultural production, concerns or constraints confronting grasscutter and other livestock production,

grasscutter production information dissemination and perceived risk in grasscutter farming for the unsuccessful grasscutter farmers. The guide for the livestock officers centred on institutional policies for livestock production, knowledge of agricultural activities, problems confronting livestock production, knowledge of grasscutter farming in the district, grasscutter production information dissemination and perceived risks in grasscutter farming. The guide was created with prompts to encourage respondents to express themselves freely and also get engaged in open conversation. Interview transcripts were written down and audio recordings from the telephone interviews were transcribed verbatim. Both semantic and latent coding were used when appropriate. The free texts were re-read and the ideas generated were categorised and linked to form distinct codes. These codes described the thematic content of the data relevant to the research question. To ensure consistency in the analysis, Braun and Clarke, (2019) approach was used where the codes were classified into minor themes which were later grouped into major themes. To deepen the meaning of the quantitative data results acquired, the findings from the data and personal observations were triangulated and interpreted inductively with direct quotations to back them where appropriate.

3.4 Ethical Considerations

The ethical issues considered in this study include introducing the purpose of the study to the participants and seeking the written consent of the respondents before soliciting the data, assuring respondents of the confidentiality of their responses, preserving their anonymity and assuring respondents that their responses would be used for only academic purpose. Also, an introductory letter was obtained from the Department of Environment and Resource Studies (DERS) indicating the name of the researcher and the purpose of the research.

3.5 Chapter Summary

The research strategy that served as the study's direction was covered in this Chapter. In a similar vein, this Chapter provided evidence for the suitability of North-Western Ghana as a context for studying farmers' attitudes, concerns, resilience to risk, management practices, WTP for grasscutter meat and preferences for grasscutter meat. The Chapter also covered the ethical protocols that were followed during the research,

the research instruments that were utilised for data elicitation, and the analysis methods for the field data that were gathered.

CHAPTER FOUR

FARMERS' RISK-TAKING EXPERIENCES (RISK ATTITUDES), CONCERNS AND MANAGEMENT STRATEGIES

4.1 Introduction

This Chapter presents results on the farmers' risk-taking experiences, attitudes, concerns and major management strategies in grasscutter production of grasscutter farmers. It addresses research questions one and two and objectives one and two. Tables 4.1 and 4.2 show the descriptive characteristics of the respondents while more explanatory statistical tests are done to explain the relationship between the risk-taking experience and five categories of risks, the association between the risk attitude of grasscutter farmers and explanatory variables (farmer and farm variables).

4.2 Socio-demographic characteristics of respondents

The descriptive statistics present a summary of respondents' information as shown in Tables 4.1 and 4.2 below. In Table 4.1, the results show that the grasscutter industry in the Upper West Region is male-dominated (n = 41, 78.8%). The age population of grasscutter farmers spanned across all the classified age groups and rearing is dominant among the economically active age group representing 41 farmers (78.8%). Most of the farmers were distributed in the Wa Municipality (19 farmers, 36.5%) with the least number of farmers located in the Sissala East district and Lawra Municipal (n = 1, 1.9%) apiece.

Table 4.1: Demographic characteristics of respondents (n = 52)

Variable	Respondents	Percent (%)
Gender	Male	78.8
	Female	21.2
Age Group (Years)	-20's	3.8
	-30's	23.1
	-40's	25.0
	-50's	26.9
	-60's	21.2
Home District	Wa East	5.8
	Nandom Municipal	34.6
	Sissala East	1.9
	Jirapa	5.8
	Lawra	1.9
	Wa West	5.8
	Lambussie	7.7
	Wa Municipal	36.5
Marital status	Married	84.6
	Separated	3.8
	Widowed	5.8
	Never married	5.8
Dependents	<5	38.5
	5 - 10	36.5
	11-15	19.2
	16-20	3.9
	>20	1.9
Educational Qualification	No basic education	23.1
	Basic Education	21.1
	Senior High School	15.4
	Tertiary Education	40.4
House size	1-5	38.5
	6-10	48.1
	11-15	9.6
	16-20	3.8

The Majority (n = 44, 84.6%) of the farmers were married. Also, a majority (n = 32, 61.5%) of the farmers had five or more dependents. Some 31 farmers (59.6%) had either

no basic education or had education up to secondary level which meant that most of the farmers did not have higher education. Those with tertiary education represent about 40%. Also, the highest household size was between six to ten people representing 48.1%.

In Table 4.2, the result on the age of respondents shows that the youngest grasscutter farmer was twenty-seven years while the oldest farmer was sixty-six years with a mean age of about forty-nine years indicating the average youthfulness of the grasscutter farmers in the region. Most of the farmers had about five years of rearing experience in grasscutter production with a mean value of 4.59. This shows that the grasscutter industry in the region is relatively young.

Table 4.2: Descriptive statistics of respondents

Variable	N	Min.	Max.	Media n	Mean	Std. Dev.
Age (Continuous variable)	52	27.00	66.00	49.00	48.96	10.97
Years of rearing (continuous variable)	52	1.00	7.00	4.50	4.59	2.34
Type of labour satisfaction						
1. Family	52	1.00	5.00	4.00		
2. Hired	52	1.00	5.00	1.00		
3. Self	52	1.00	5.00	5.00		
Labour level contribution satisfaction						
1. Family	52	1.00	5.00	4.00		
2. Hired	52	1.00	6.00	1.00		
3. Self	52	1.00	5.00	5.00		
Task or activity performed on farm satisfaction						
1. Manager	52	3.00	5.00	5.00		
2. Successor	52	1.00	5.00	4.00		
3. Partnership	52	1.00	5.00	4.00		
Veterinary services satisfaction						
1. Treatment of diseases	52	1.00	4.00	2.00		
2. Preventing of diseases	52	1.00	5.00	2.00		
3. Provision of drugs	52	1.00	4.00	2.00		
4. Protection of human life	52	1.00	5.00	3.00		

The type of labour satisfaction, level of labour contribution, the task performed on the grasscutter farm and veterinary services on the grasscutters were measured on an ordinal scale of 1 = very dissatisfied, 2 = dissatisfied, 3 = no opinion, 4 = satisfied and 5 = very satisfied. The median values of the type of labour satisfaction show that grasscutter farmers were satisfied with family (4.00) and self-labour (farmer) (5.00) in the grasscutter business. This was the same for the level of labour contribution in the grasscutter business. The manager or farmer, successor to the farm and partners (GIfT) all had a high level of satisfactory tasks or activities performed on the grasscutter farm. The median values for treatment of diseases (2.0), prevention of diseases (2.0) and provision of drugs (2.0) were all rated as dissatisfied while protection of human lives (3.0) was rated as ‘no opinion’ by the farmers.

4.2.1 Risk taker type by age group of grasscutter farmers

Figure 4.1 shows risk-taker types among grasscutter farmers. The result shows that all the classified age groups of the farmers are either risk takers, risk averse or risk neutral. Generally, the results show that older farmers were more willing to take risks than younger farmers with a majority of them aged 50-59 years. A good number of them also expressed risk neutrality with the highest between the ages of 40-49.

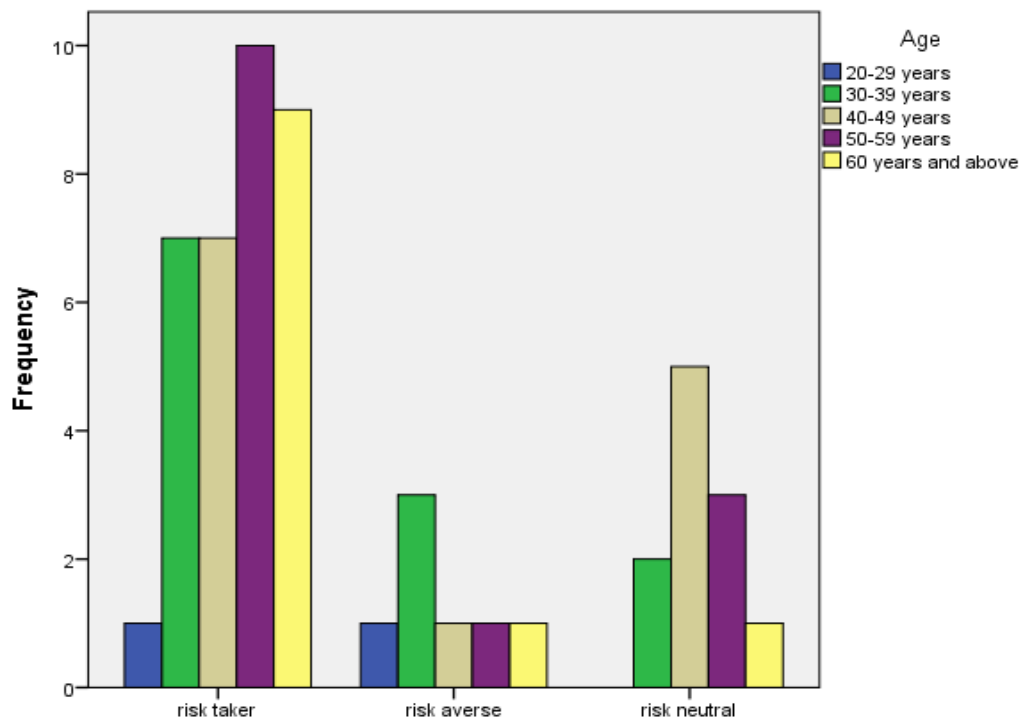


Figure 4.1: Risk taker type of grasscutter farmers

4.2.2 Main assets of grasscutter farmers by age

In Figure 4.2, social assets spanned across all the age groups indicating that all the respondents possess social assets. Human assets were absent in the respondents who were below the age of thirty years. The rest of the classified age group possessed human capital which could be a result of farming activities and other family activities needing more hands. Respondents began to amass physical assets from thirty to fifty-nine years. Financial assets were noticeable from fifty to fifty-nine years. Few farmers aged forty years and above possessed natural capital.

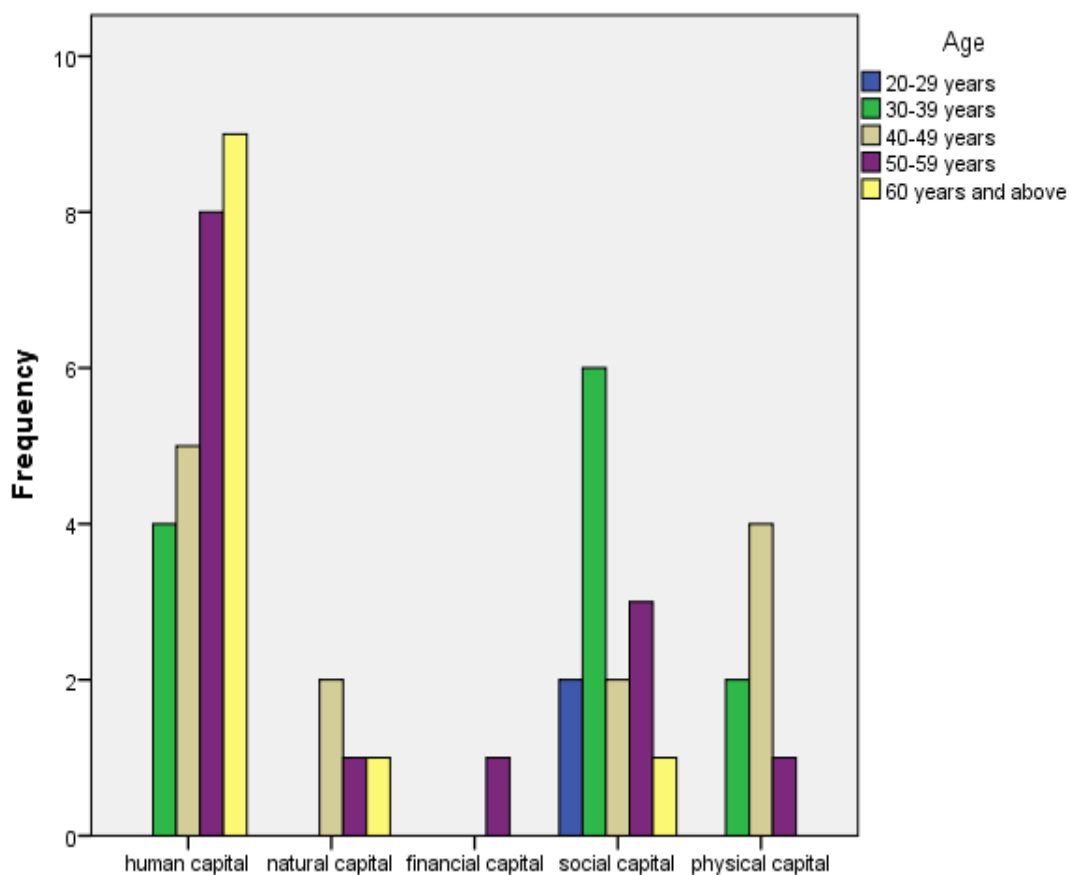


Figure 4.2: Main assets by age group of grasscutter farmers

4.2.3 Livestock owned by grasscutter farmers

GSS (2012) reported that around 41% of rural populations manage some livestock. This means that approximately 6 million rural households' livelihood depends on livestock production in Ghana. In Figure 4.3, the majority of the farmers did not keep livestock such as turkeys, rabbits, guinea pigs, ducks, doves, donkeys, cattle and cats. Livestock that were commonly kept by grasscutter farmers include sheep, pigs, guinea fowls,

goats, dogs, and chickens. Seventy-five percent (75.0%) of farmers kept one to five dogs while 25.0% did not keep dogs in their homes. Few (9.6%) of the grasscutter farmers own between one to ten donkeys. About 8.0% of the farmers reared doves while 92.3% did not keep them. Though about 12.0% did own chickens, 88.5 % of farmers kept chickens. About 33.0% of those who reared chickens had from eleven to fifteen of them while about 6.0% had twenty or more chickens. A majority (53.8%) of respondents reared guinea fowls. Half of the respondents did not rear pigs. Also, 73.0% of the farmers did not keep ducks. Seventy-five percent of the farmers had grasscutters from one to five while about 2.0% had grasscutters above ten. About 75.0% of the farmers did not own rabbits while about 90.0% of the farmers did not own turkey. Also, about 69.0% did not keep cats in their homes. About 98.0% of the farmers did not own guinea pigs. Also, as many as 81.0% did not own cattle.

The data from the key informant interviews also revealed that many kinds of livestock are reared in the districts or municipalities of grasscutter farmers. This finding suggests that many rural dwellers rear one or more kinds of livestock as part of their livelihood enhancements among other reasons.

During the interviews with the key informants, it was revealed that different kinds of livestock are largely kept by farmers. For instance, when one of the unsuccessful grasscutter farmers was asked about the kinds of livestock largely kept in his district, he said;

“In this district, several kinds of livestock are reared by the people. The most popular livestock reared are goats, pigs, dogs, cattle, sheep and poultry. The dog is not eaten by many people here because majority of the people here are Muslims but they rear them to provide security”
(Fifty-seven-year-old unsuccessful grasscutter farmer, Wa East District, September 2023).

The response from the key informant above agrees with the expression of a MoFA livestock officer. During the interview, the researcher asked the official about the kinds of livestock that are largely kept in the district he provides extension services. The official responded as follows;

“In many of the districts that I have been transferred to including my current district, the commonest livestock reared by the majority of the

people are goats, cattle, sheep, poultry and pigs. Some farmers also keep rabbits, guinea pigs, donkeys and dogs but these are not so common” (Forty-eight-year-old MoFA district livestock officer, September 2023).

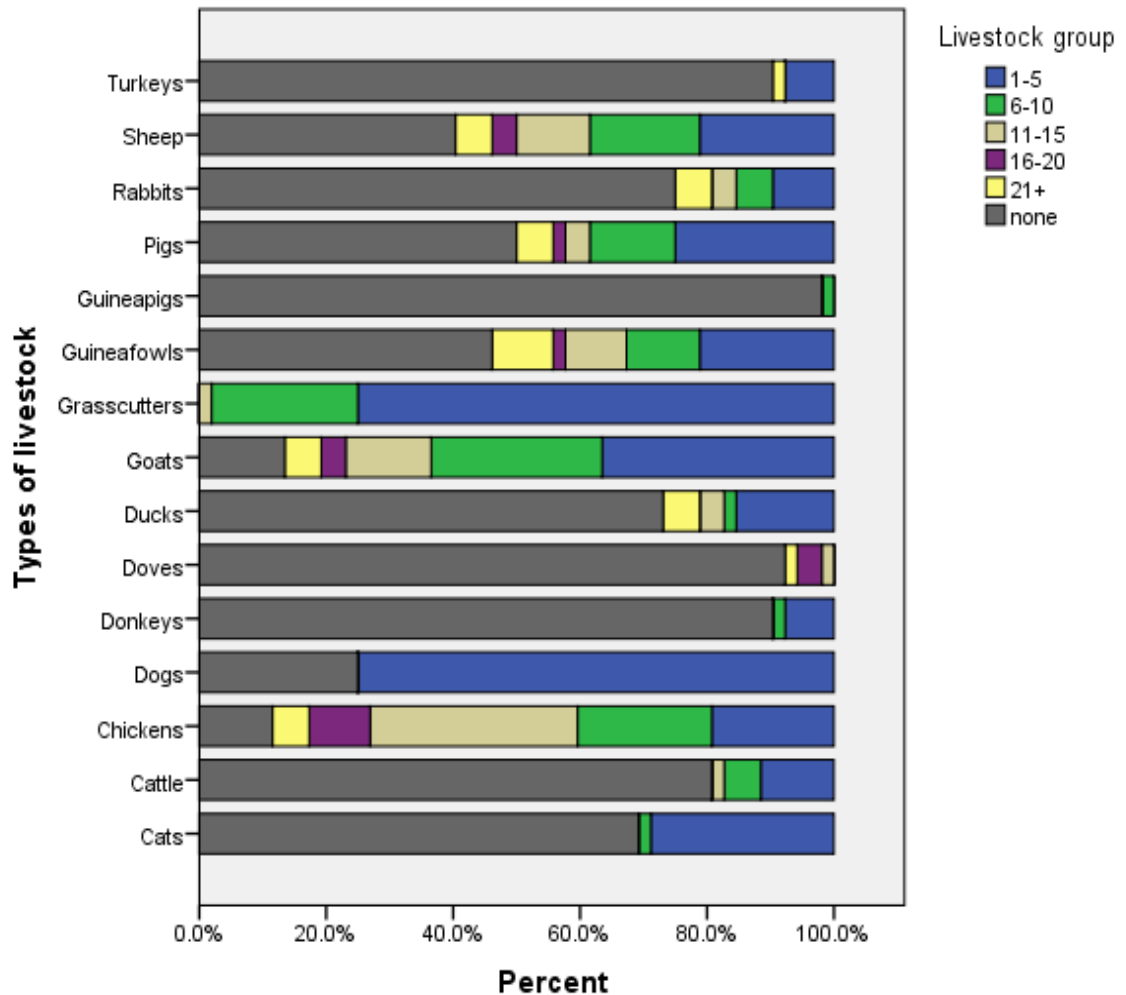


Figure 4.3: Livestock owned by grasscutter farmers

4.2.4 Crops owned by grasscutter farmers in acres

Figure 4.4 below shows the various types of crops and acres owned by grasscutter farmers in the Upper West Region. The results show that grasscutter farmers cultivated all the crops listed. Most of them however did not cultivate many of the crops on a large scale. Crops that were mostly cultivated include maize (90.0%), rice (56.0%), mango (60.0%), beans (67.0%), shea (54.0%), kenaf (69.0%), or (79.0%), pepper (69.0%), tomatoes (71.0%), groundnuts (75.0%) and Bambara (50.0%). A majority (58.0%) of the maize farmers (58.0%), rice farmers (29.0%), beans farmers (39.0%), shea farmers (33.0%) and groundnuts farmers (58.0%) cultivated one or more acres. Majority of the

farmers did not cultivate millet (56.0%), sorghum (52.0%), cocoa (98.0%), cashew (79.0%), cassava (79.0%), cocoyam (79.0%), dawadawa (58.0%), baobab (65.0%), garden eggs (75.0%), tamarind (92.0%) and tiger nuts (92.0%).

A male unsuccessful grasscutter farmer in Wa Municipal was asked about the kinds of crops and specific varieties that are cultivated in his district. He responded as follows;

“In this Municipal, several crops are cultivated. The major ones I can easily remember are groundnuts, maize, millet, cowpea, sorghum and different types of vegetables. I do not know the specific names of the varieties of the crops but for maize, we have white and yellow maize. We also have white beans, red and black beans” (Fifty-one-year-old unsuccessful grasscutter farmer, Wa Municipal, August 2023).

Similar responses were given by a MoFA official about the kinds of crops and varieties that are grown.

In this Municipal, maize, groundnut, cowpea, sorghum, rice, millet, yam, cassava, and vegetables are largely cultivated. The varieties I can recollect are maize (both open-pollinated and hybrid), local millet and millet that are imported, sorghum (kapaala mostly preferred by Guinness Ghana Limited and local sorghum) and groundnut (Chinese, Oboshie, Obolo etc) (MoFA officer, Wa Municipal, August 2023).

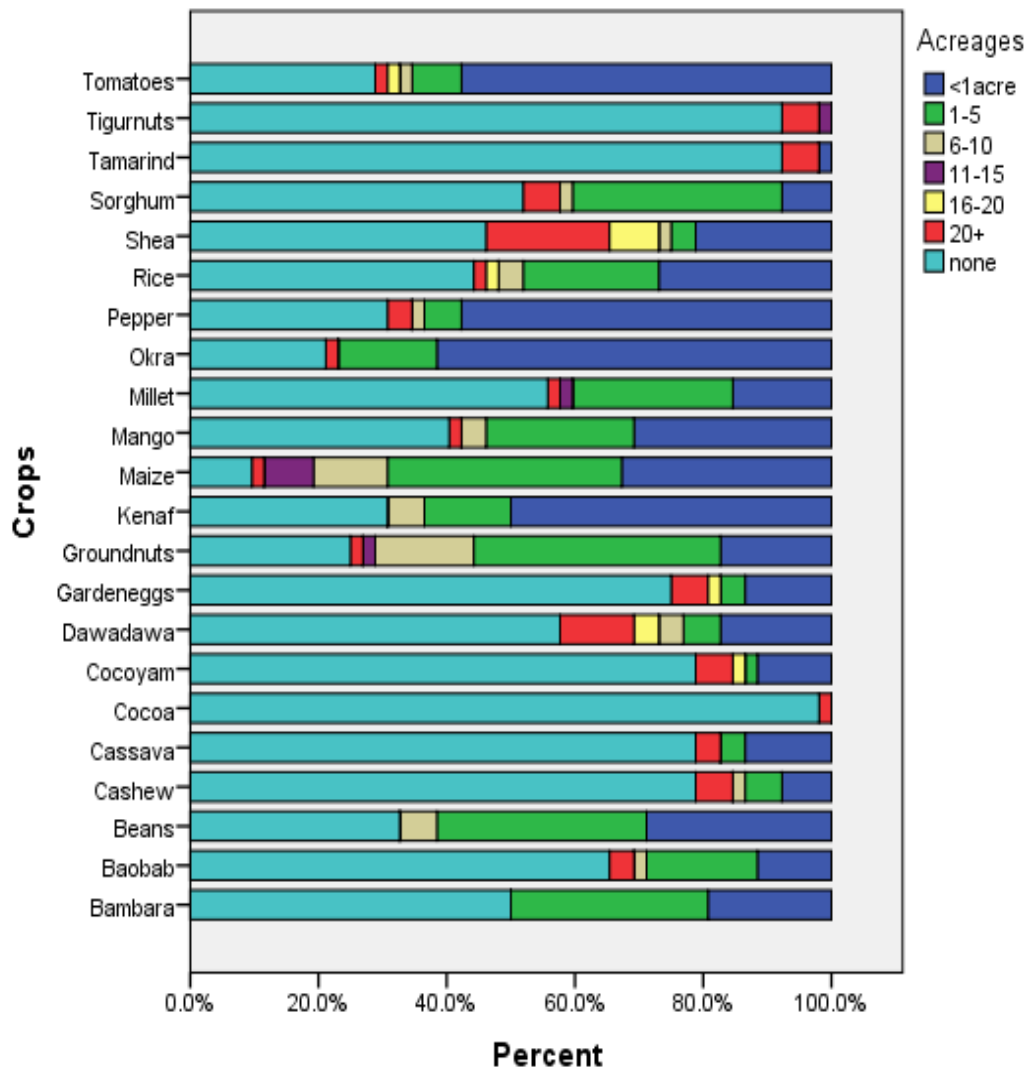


Figure 4.4: Crops owned by grasscutter farmers in acres

4.3 Risk Attitude (Risk-Taking Experience) of Grasscutter Farmers

The result in Table 4.3 shows that grasscutter farmers agreed on the average to take risks on production (4.667), financial (4.33), marketing (4.11) and human personnel issues (4.06). They however expressed less willingness to take risks on institutional issues (3.28).

Table 4.3: Descriptive statistics of types of risks experienced by grasscutter farmers

Variable	Mean	Std. Dev.	Min	Max
Production risks	4.538	0.541	3	5
Financial risks	4.192	0.687	3	5
Marketing risks	4.154	0.751	1	5
Human personnel risks	4.173	0.706	2	5
Institutional risks	3.577	0.957	1	5

Risk-taking experience was modelled on five risk categories namely production, financial, marketing, human personnel and institutional risks experienced by grasscutter farmers. Table 4.4 shows the bivariate and multivariate ordered logistic regression output showing the relationship between risk attitude and five risk categories. The odds of risk-taking experience were higher for marketing risks [COR = 2.25 (95% CI = 1.01–5.01), $p = 0.05$] and production risks [COR = 4.58 (95% CI = 1.30–16.09), $p = 0.02$] and higher than personnel or human resource, institutional and financial risks and were significantly associated with risk attitude at the bivariate model. In the multivariate model, the odds of farmers' risk experience for marketing risk decreased and was not significantly associated with the risk-taking of grasscutter farmers while the odds of farmers' risk-taking experience for production risks increased [AOR = 10.48 (95% CI = 1.50–73.16), $p = 0.02$] and was significantly associated with risk-taking of grasscutter farmers. The odd ratios show that all the farmers have higher odds of accepting the risk categories.

The data from the qualitative survey provided similar results. A key informant was asked about risks he perceived in grasscutter production and he responded as follows;

“Yes, I perceive risks like cost (production and financial risks), market (marketing risks), diseases (production risks), lack of veterinary care (institutional risks), death and injuries (production and human personnel risks) in all animal production including the grasscutter but I did not know grasscutter could die easily (production risks), I thought they are very strong animals. For the grasscutter specifically, lack of feed (production risks) and sudden death (production risks) are major

risks. I lost all my grasscutters as a result of sudden death (production risks)” (Sixty-three years old unsuccessful grasscutter farmer, Lambussie District, September 2023).

Table 4.4: Ordered logistic regression of risk-taking of grasscutter farmers

Variable	Unadjusted			Adjusted		
	COR	p-value	95%CI	AOR	p-value	95%CI
Marketing risks	2.25	0.05	1.01-5.01	1.56	0.39	0.56-4.38
Personal and human resource risks	1.13	0.80	0.45-2.82	0.34	0.14	0.08-1.42
Production risks	4.58	0.02	1.30-16.09	10.48	0.02	1.50-73.16
Institutional risks	1.09	0.83	0.47-2.56	0.93	0.90	0.32-2.73
Financial risks	1.37	0.23	0.82-2.29	1.13	0.68	0.64-1.97

Ordered logistic regression was performed to model the association between risk attitude and farmer and farm variables. The explanatory power of the variables used in this study was found to be about 44% which is much higher than the 38% by Jing et al. (2001) and 35% by Aye and Oji (2009). It is therefore assumed that socioeconomic characteristics play an important role in grasscutters farmers’ risk attitude.

From Table 4.4, the coefficient for males is negative and significant indicating that male grasscutter farmers are more risk-averse than their female counterparts. The age range of grasscutter farmers was also positive and significant. From the result, the indication is that grasscutter farmers above thirty years have a higher probability of taking risks than farmers below thirty years. Farmers aged from thirty to thirty-nine years have a 26.283 unit’s higher probability of taking risks than farmers below thirty years. The probability decreased to 15.075 units for farmers aged from forty to forty-nine and increased to 27.026 units for farmers aged from fifty to sixty. Farmers aged above sixty also expressed a 22.305 unit’s higher probability of success as compared to farmers below thirty.

The result on marital status shows an inverse and significant relationship with the risk attitude of grasscutter farmers. Farmers who were married, separated or divorced have a low probability of taking risks compared to those who were never married. On education, the result shows that farmers who had formal education from basic to tertiary have a higher probability of success in taking risks as compared to those who have never been to school. Households with five to ten members have 3.137 units higher success on risk attitude compared to farmers with household members below five. However, the probability of farmers' risk attitude decreased when the household members increased beyond ten.

There was an inverse relationship between farmers who cared for six to ten people and risk attitude but this was not significant. A positive and significant relation however occurred when the farmers cared for eleven to fifteen people. Another inverse non-significant relationship occurred when the dependents were sixteen to twenty people and increased significantly to 23.099 units higher when the dependents were above twenty as compared to when the dependents were five or less. This indicates generally that grasscutter farmers would have a positive attitude toward taking risks in the grasscutter business when they have people to support them.

Grasscutter farmers had a lower probability of a risk attitude when the years of rearing were more than five. This may be due to the difficult nature of keeping grasscutters under captivity and farmers would probability want to keep them for a few years and minimise risks.

Similarly, grasscutter farmers would have a low success probability toward risk attitude when the farm size is more than five. On off-farm jobs of grasscutter farmers, casual work was positive and significant indicating that grasscutter farmers will express a higher positive attitude toward risk as off-farm income will reduce the dependency on the grasscutter farm income.

There was an inverse and significant relationship toward risk attitude when the main source of income was from NGOs. However, grasscutter farmers showed a higher probability of success toward risks attitude when the source of funds is from farmer cooperatives. When the general farm income was above GHC20,000.00, farmers showed a positive, significant and higher probability of taking risks as compared to

farmers whose general farm income was below GHC20,000.00. Also, farmers who sold grasscutters above GHC500.00 showed a positive and significant risk attitude. Those who never sold grasscutters had an inverse relationship with a risk attitude.

Table 4.5: Ordinal logistic regression of farmer and farm variables influencing risk attitude of grasscutter farmers

Variable	Coef.	St. Err.	t-value
Gender			
Female (REF)			
Male	-12.079***	2.667	-4.53
Age			
20-29 (REF)			
30-39	26.283***	6.717	3.91
40-49	15.075***	5.505	2.74
50-59	27.026***	6.725	4.02
60 and above	22.305***	6.714	3.32
Marital status			
Never married (REF)			
Married	-18.711***	4.233	-4.42
Separated	-21.976***	6.078	-3.62
Widowed	-29.498***	6.21	-4.75
Education level			
No basic education (REF)			
Basic education	19.806***	4.16	4.76
Secondary education	28.9***	5.777	5.00
Tertiary education	16.859***	3.462	4.87
Household size			
1-5 (REF)			
6-10	3.137*	1.819	1.72
11-15	-13.795***	3.949	-3.49
16-20	-8.084*	4.535	-1.78
Number of dependents			
1-5 (REF)			
6-10	-2.589	1.78	-1.45
11-15	4.93**	1.938	2.54
16-20	-2.996	2.782	-1.08
20 and above	23.099***	6.117	3.78
Years of rearing			
1-5 (REF)			
6-10	-14.912***	3.508	-4.25
11-15	-5.913*	3.153	-1.88

Farm size			
1-5 (REF)			
6-10	-1.892*	1.148	-1.65
11-15	-21.799***	5.371	-4.06
Off-farm job			
Petty trading (REF)			
Causal job	6.369**	2.556	2.49
Transportation business	8.439	6.758	1.25
Argo-processing	-0.333	1.275	-0.26
Manufacturing	-7.928	6149.127	-0.00
Main source of finance			
Own capital (REF)			
NGO	-2.778*	1.665	-1.67
Credit from farmer cooperatives	8.686**	3.784	2.30
Friends and relatives	8.664	6149.125	0.00
General farm income (GHC)			
<20,000 (REF)			
20,000-40,000	10.516***	2.411	4.36
40,000-60,000	4.404**	1.974	2.23
Grasscutter sales (GHC)			
<500 (REF)			
500-1000	7.804***	2.473	3.16
>1000	1.475	2.531	0.58
None	-12.245***	3.718	-3.29
Mean dependent var	4.127		
Pseudo r-squared	0.438		
Chi-square	94.557		
Akaike crit. (AIC)	217.339		

*** $p < 0.01$, ** $p < .05$, * $p < 0.1$

4.4 Farmers' Risks Concerns (Constraints)

Table 4.5 shows the concerns or constraints of grasscutter farmers toward risks. The result generally shows that a majority of grasscutter farmers expressed that they were either slightly concerned, somewhat concerned or very concerned about each of the risks listed. The result shows that a majority (90.40%) of the farmers were somewhat concerned about losses due to death while a few (3.80%) of them were not concerned. The result also reveals that a majority of grasscutter farmers were very concerned about feed shortage (63.50%), lack of access to credit (59.60%), little skill development (59.60%), little or no veterinary services (63.50%), premature death of grasscutters (80.80%), insufficient breeding stock (53.80%), frequent or sudden death of

grasscutters (86.50%), disease outbreak (63.50%), aggression of grasscutters (65.40%), lack of medication for grasscutters (55.80%), poor technical know how to handle grasscutters (57.70%) and little or no institutional or government support for grasscutter production (65.40%). Also, half of the grasscutter farmers were not concerned about the thievery of their grasscutters while 7.70% of them thought that the theft of grasscutter was not relevant to grasscutter production.

A key informant was asked about the challenges in grasscutter production that made him unsuccessful and this is what he said;

“Grasscutter is an aggressive animal and there is limited feed for it especially in the dry season. They also easily die and I just could not cope with these challenges successfully” (A Fifty-four years old female unsuccessful farmer, Lawra Municipal, August 2023).

When a MoFA official was asked about the general concerns of livestock farmers including the grasscutter and the measures being taken by the institution to manage the concerns. He expressed as follows;

“Yes, there are several concerns in livestock production including the grasscutter. There are problems like an inadequate supply of improved breed of livestock and inadequate livestock interventions in production. Yes, we developed some measures to confront these challenges. We are looking at how to facilitate the livestock value chain development, stock improvement and provision of suitable infrastructure for all kinds of livestock” (MoFA official, Nandom Municipal, August 2023).

Table 4.6: Concerns or constraints of grasscutter farmers toward risks

Variable	Percent (%)				
	Not concerned	Slightly concerned	Somewhat concerned	Very concerned	Not relevant
Losses of grasscutters due to mortality	3.80	1.90	90.40	3.80	0.00
High cost of rearing grasscutters	7.70	21.20	32.70	38.50	0.00
Uncertainty in regular supply of grasscutters for expansion	3.80	19.20	30.80	46.20	0.00
Uncertainty in consumer demand of grasscutters meat	11.50	17.30	32.70	34.60	3.80
Uncertainty about future availability of feed	3.80	19.20	34.60	42.30	0.00
Inability to adapt to new technology on grasscutter rearing	11.50	19.20	19.20	44.20	5.80
Changes in laws and regulations on grasscutter rearing	17.30	21.20	23.10	34.60	3.80
Increased temperature causing heat stress to grasscutters	7.70	23.10	21.20	42.30	5.80
Decreased temperature causing severe cold to grasscutters	9.60	23.10	19.20	46.20	1.90
Poor forage quality	7.70	15.40	30.80	46.20	0.00
Feed shortage	5.80	13.50	13.50	63.50	3.80
Lack of access to credit	13.50	11.50	7.70	59.60	7.70
Little skill development	5.80	11.50	21.20	59.60	1.90
Little extension services	3.80	19.20	26.90	46.20	3.80
Little or no veterinary services	7.70	9.60	13.50	63.50	5.80
Premature death of grasscutters	3.80	1.90	9.60	80.80	3.80
Poor breeds	7.70	21.20	26.90	44.20	0.00

Insufficient breed stock	1.90	21.20	23.10	53.80	0.00
Low birth weight	3.80	26.90	23.10	44.20	1.90
Lack of breeding equipment like troughs and cages	9.60	25.0	23.10	42.30	0.00
Frequent and sudden death of grasscutters	5.80	0.00	3.80	86.50	3.80
Diseases outbreak	11.50	5.80	17.30	63.50	1.90
Size of grasscutter too small	5.80	9.60	38.50	46.20	0.00
Aggression of grasscutters	11.50	3.80	15.40	65.40	3.80
Theft of grasscutters	50.00	13.50	9.60	19.20	7.70
Snake attacks from search for feed	26.90	17.30	17.30	36.50	1.90
Lack of medication for grasscutters	5.80	15.40	19.20	55.80	3.80
Poor technical know how to handle grasscutters	7.70	5.80	25.00	57.70	3.80
Little or no institutional support (government)	9.60	13.50	11.50	65.40	0.00
Injury and accident of care taker	5.80	23.10	21.20	46.20	3.80

Table 4.6 shows the result of the rank order of concerns of grasscutter farmers toward thirty listed risks. The mean ranked result indicates that the most concerned risk source among grasscutter farmers is losses of grasscutters due to mortality. The least concerned risk source was the caretaker of grasscutters.

Table 4.7: Rank order of concerns or constraints of grasscutter farmers toward risks

Variable	Mean	Std. Dev.	Rank
Losses of grasscutters due to mortality	3.90	0.63	1
High cost of rearing grasscutters	3.83	0.96	2
Uncertainty in the regular supply of grasscutters for expansion	3.79	0.89	3
Uncertainty in the consumer demand of grasscutters' meat	3.50	1.08	4
Uncertainty about future availability in feed	3.46	0.87	5
Inability to adapt to new technology on grasscutter rearing	3.46	1.16	6
Changes in laws and regulations on grasscutter rearing	3.44	1.19	7
Increased temperature causing heat stress to grasscutters	3.40	1.09	8
Decreased temperature causing severe cold to grasscutters	3.38	1.08	9
Poor forage quality	3.37	0.96	10
Feed shortage	3.37	0.98	11
Lack of access to credit	3.33	1.21	12
Little skill development	3.29	0.93	13
Little extension services	3.27	0.95	14
Little or no veterinary services	3.25	1.02	15
Premature death of grasscutters	3.19	0.72	16
Poor breeds	3.19	0.99	17
Insufficient breed stock	3.15	0.87	18
Low birth weight	3.15	0.97	19
Lack of breeding equipment like troughs and cages	3.15	1.04	20
Frequent and sudden death of grasscutters	3.13	0.76	21
Diseases outbreak	3.13	1.05	22
Size of grasscutter too small	3.08	0.86	23
Aggression of grasscutters	3.08	1.06	24

Theft of grasscutters	3.02	1.43	25
Snake attacks from search for feed	3.02	1.28	26
Lack of medication for grasscutters	2.98	0.99	27
Poor technical know how to handle grasscutters	2.87	0.96	28
Little or no institutional support (government)	2.69	1.04	29
Injury and accident of care taker	2.21	1.03	30

4.5 Management Strategies of Grasscutter Farmers

In Table 4.7, the means and standard deviations are ranked from the major management strategy to the least management strategy used by grasscutter farmers. Based on the five-point Likert scale rating from disagree strongly to agree strongly, the result shows that calling on experts to check on the health of the grasscutters (institutional risks), presenting clean feed to grasscutters (production risks), learning from friends and workshops to improve the business (personnel or human resource risks), reporting threats and diseases to experts (production risks), identification of problems and solving them (production risks), being a member of a producer group (institutional risks), self-supervision of grasscutters (personnel or human resource risks), keeping grasscutters in good location (production risks), enabled secured housing system for grasscutters (production risks), being focus on both threats and opportunities in the grasscutter business (production risks), ensuring enough bedding materials to protect the grasscutters (production risks), paying attention to the environment of grasscutters (institutional risks), having sufficient labour (personnel or human resource risks), maintaining good contacts with colleague farmers to discuss issues concerning grasscutters (personnel or human resource risks), risk diversification such as crop cultivation and rearing of other livestock (production risks) and relying on market information (for example government reports, private market news services) in making my marketing decisions (marketing risks) were above the overall mean as ranked respectively were the major management strategies employed by grasscutter farmers. Most of the management strategies were centred on production risks. Fifteen of the management strategies listed were below the overall mean and lie between neutral to disagree, with grasscutter farmers rating ‘having a quality assurance program’ in their grasscutter farm as the least management strategy.

During the key informant interviews, an unsuccessful grasscutter farmer was asked about some of the management strategies he would advise grasscutter farmers to employ. The key informant revealed as follows;

“I failed because I did not do certain things right despite advice from GIfT officers. They provided the cage for free but I did not have a secured enclosed area to keep the caged. But what I can now observe to be better for grasscutters is that farmers should construct a good place for grasscutters. Grasscutters are new to us so they should not be combined with other animals, try to monitor grasscutters yourself and don’t leave them to the hands of family alone. They are not like other animals that can easily be controlled by kids. Also, provide constant care. Farmers must have a supporting hand so that if they are not around, the animals can be cared for” (Fifty-year old male farmer, Jirapa District, September 2023).

Table 4.8: Ranked order of major management strategies among grasscutter farmers

Variable	Mean	SD	Rank
I call on experts to check my animals when they fall sick	4.71	0.54	1
I ensure that the feed I give to my grasscutters is clean	4.69	0.51	2
I am willing to learn from friends and workshop to improve my grasscutter business	4.67	0.62	3
I report any threat such as death and diseases for technical experts to advise	4.50	0.58	4
I try as much as possible to identify problems in my farm and solve them	4.46	0.54	5
I belong to a producer group to assist me in the business	4.44	0.70	6
I supervise my grasscutters myself	4.44	0.64	7
I ensure good location of my grasscutters	4.38	0.89	8
I have secured housing system to avoid theft of my grasscutters	4.29	0.87	9
I focus on both the threats and opportunities of my farm business	4.21	0.57	10
My grasscutters have enough beddings to hide from strangers	4.21	0.70	11
I pay attention to environmental issues on my grasscutter production	4.17	0.83	12

I have sufficient labor to carry on production in case of my absence	4.00	0.97	13
I have good contacts with colleague farmers to discuss farm related issues	3.98	1.04	14
I diversify risk by rearing other livestock and crops	3.88	1.00	15
I rely heavily on market information (for example government reports, private market news services) in making my marketing decisions.	3.69	1.11	16
I build trust with buyers with consensus on fixed price of grasscutters	3.50	1.29	17
I have documented records for my grasscutter business	3.48	1.06	18
I belong to cooperatives to enable me access credit at lower cost	3.37	1.53	19
I track market price information on grasscutter to manage price risk	3.33	1.53	20
I have off-farm income to support my business	3.29	1.18	21
I have liquidity against losses of my grasscutters	3.21	1.27	22
Variability of weather conditions do not affect my grasscutter business	2.94	1.14	23
I engage in forward pricing of my grasscutters	2.79	1.30	24
I grow forages all seasons to provide enough feed for grasscutter	2.62	1.12	25
I utilize veterinary services to keep my grasscutters health	2.58	1.26	26
I engage in market contracts to sell my grasscutters	2.46	1.16	27
I pay for the services of people to take care of the animals when I am traveling	2.27	1.57	28
I do not have much space to store feed for my grasscutters	1.81	1.05	29
I insure my grasscutter business against losses	1.73	1.24	30
I have quality assurance program for my grasscutter business	1.58	0.75	31
Overall mean	3.54	0.99	

4.6 Grasscutter Farmers' Resilience as Part of Risk Management

4.6.1 Measuring grasscutter farmers' resilience

Table 4.8 shows the descriptive statistics and total score of the 14-item resilience scale used in this study. The items were measured on a five-point Likert scale from strongly disagree with a value of one to strongly agree with a value of five and a total score of 70.0. The original RS-14 scale is measured on a seven-point Likert scale with a total score ranging from 14-98. Resilience levels defined from the RS-14 scale included;

very low (14-56), low (57-64), on the low end (65-73), moderate (74-81), moderately high (82-90) and high (91-98) (Wagnild, 2009a). In this study, the mean values show that all the respondents generally agree on each of the resilience scale items and therefore demonstrated moderately high resilience of about 86.0% in grasscutter production with a total score of 60.18 (SD = 8.62) out of a possible 70.0 based on the 5-point Likert ratings.

Table 4.9: 14-item Resilience Scale (RS-14) descriptive statistics of the single items and the total score of the scale of respondents (N = 52)

Item	N	Mean	SD
RS-14-01: I usually manage my way or another	52	4.25	0.59
RS-14-02: I feel that I handle many things at a time	52	4.15	0.75
RS-14-03: I can get through difficult times because I have experienced difficult time before	52	4.35	0.59
RS-14-04: In an emergency, I am someone people can generally rely on	52	4.33	0.65
RS-14-05: When I am in a difficult situation, I can usually find my way out of it	52	4.35	0.59
1. Self-reliance total	52	21.43	3.17
RS-14-06: I feel proud that I have accomplished things in my life	52	4.29	0.64
RS-14-07: I keep interested in things	52	4.29	0.61
RS-14-08: My life has meaning	52	4.48	0.61
2. Purpose total	52	13.06	1.86
RS-14-09: I usually take things in stride	52	3.73	0.69
RS-14-10: I can usually find something to laugh about	52	3.61	0.69
3. Equanimity total	52	7.34	1.38
RS-14-11: I am determined	52	4.71	0.46

RS-14-12: Self-discipline is important	52	4.87	0.34
4. Perseverance total	52	9.58	0.80
RS-14-13: I am friends with myself	52	4.17	0.92
RS-14-14. My belief in myself get me through hard times	52	4.61	0.49
5. Authenticity (total mean score =	52	8.78	1.41
Total score for RS-14		60.19	8.62

The Cronbach's alphas (α) value was 0.84 which demonstrates strong psychometric properties of the modified RS-14 scale. This value is however lower than the Cronbach's alphas (α) result of 0.87 obtained by Nuvey et al. (2020) among cattle farmers in Ghana and 0.90 by Wagnild (2009a). Grasscutter farmers demonstrated moderately high resilience of about 86.0% out of the total possible outcome with self-reliance being the best-performing dimension of about 36.0% of the total mean score.

Table 4.9 shows the test of normality for the dependent variable (risk management construct) and independent variables of the resilience scale items constructs (self-reliance construct, purpose construct, equanimity construct, perseverance construct and authenticity construct). The result based on the Shapiro-Wilk test shows that both dependent and independent variables were statistically significant. Hence, ordinal logistic regression was employed in the analysis.

Table 4.10: Test of normality for risk management constructs and resilience items

Variable	Number of observations	Sig.
Risk management	52	0.045
Self-reliance	52	0.027
Purpose	52	0.001
Equanimity	52	0.001
Perseverance	52	0.001
Authenticity	52	0.001

Table 4.10 shows the result of the bivariate and multivariate regression analysis. In the bivariate model, the result shows that all explanatory variables had odd ratios of more than one suggesting a higher farmers resilience relationship and risk management. Self-reliance, purpose and authenticity were statistically significant ($p \leq 0.05$). In the adjusted model, only purpose and authenticity remained statistically significant while self-reliance was not significant indicating the effect of interaction from the covariates. In both unadjusted and adjusted models, the resilience characteristics ‘purpose’ had the highest odd ratio value indicating the most important resilient variable on grasscutter risk management strategies.

Table 4.11: Regression results showing the relationship between risk management and resilience variables of grasscutter farmers

Variable	Unadjusted			Adjusted		
	COR	p-value	95%CI	AOR	p-value	95%CI
Self-reliance	3.49	0.02	1.23-9.92	0.72	0.68	0.15-3.32
Purpose	5.17	0.01	1.78-15.05	5.44	0.02	1.25-23.65
Equanimity	2.04	0.07	0.95-4.39	1.30	0.55	0.55-3.12
Perseverance	2.03	0.30	0.54-7.68	0.56	0.46	0.12-2.59
Authenticity	3.22	0.01	1.27-8.17	3.51	0.02	1.17-10.49

4.7 Chapter Summary

The Chapter highlighted the risk-taking experience of grasscutter farmers in North-West Ghana which revealed that grasscutter farmers exhibited variability in their risk-taking experiences or attitudes toward risks. Similarly, the Chapter highlights the various risk concerns and resilience management strategies adopted by grasscutter farmers. To that end, this study has contributed to our understanding of how important production and marketing risks are to farmers and the constraints such as frequent or sudden death of grasscutters, premature death of grasscutters, aggression of grasscutters, little or no institutional or government support for grasscutter production. Furthermore, the management strategies used by grasscutter farmers include calling on experts to check on their grasscutters when they fall sick, presenting clean feed to

grasscutters and engaging themselves in networking with other farmers. Also, the Chapter showed that grasscutter farmers demonstrated moderately high resilience with self-reliance being the best-performing dimension in grasscutter production while the resilience characteristics ‘purpose’ and ‘authenticity’ were the most important resilient variables in grasscutter risk management strategies.

CHAPTER FIVE

CONSUMERS' PREFERENCES AND WILLINGNESS TO PAY FOR GRASSCUTTER MEAT

5.1 Introduction

The results of consumers' WTP for grasscutter meat are presented in this Chapter. The Chapter presents a detailed description of the socio-economic characteristics, WTP decisions of consumers, different premium bid levels, Mean Willingness to Pay Amount (MWTPA) and various estimation methods of factors influencing WTP for grasscutter meat and preferences for the meat. It addresses research question three and objective three.

5.2 Socio-economic Characteristics of Respondents

This section gives the outline of socio-economic characteristics such as age distribution, gender, region, religion, marital status, educational level, primary occupation, ethnicity and monthly income of respondents for this study. It also includes the household size and number of dependents of respondents.

Table 5.1 shows the age distribution of respondents. The study categorised age into five groups and defined them as young (>30), young adults (30-39), mid-adults (40-49), mature adults (50-60) and the aged (60 and above). By these groupings, the result shows that 94.19% of the respondents are economically active while 5.81% are beyond the retirement age. As indicated in Table 5.2, the minimum and maximum ages of respondents interviewed for this study were 18 and 79 years with a mean age of 37.53 indicating the youthfulness of age of respondents according to this study. The result in Table 5.1 indicates that the respondents were male dominated representing about 75% of total responses while the female represented about 25%. The result therefore suggests that males appear to eat out than their female counterparts.

As indicated in Table 5.1, respondents were from seven regions in Ghana. A majority (93.36%) of the respondents were from the Upper West Region followed by the Ashanti and Volta regions of about 2% and 1.66% respectively while the least number of respondents were from the Central Region (0.41%). Greater Accra, Savannah and Upper East Regions had 0.83% respondents apiece.

Table 5.1: Socio-economic characteristics of respondents (N=241)

Variable	Respondents	Percent (%)
Age Group (Years)	20's	25.31
	30's	40.66
	40's	17.84
	50's	10.37
	60's	5.81
Gender	Females	24.90
	Males	75.10
Region	Central Region	0.41
	Greater Accra	0.83
	Savanah Region	0.83
	Upper East Region	0.83
	Volta Region	1.66
	Ashanti Region	2.07
	Upper West Region	93.36
Religion	Traditional believer	6.22
	Muslim	16.18
	Christian	77.59
Marital status	Divorced	3.32
	Widowed	4.56
	Separated	5.39
	Never married	26.97
	Married	59.75
Educational Qualification	None	13.28
	Basic Education	17.84
	Senior High School	26.97
	Tertiary Education	41.91
Primary Occupation	Trader	12.03
	Other	12.86
	Famer	15.35
	Technical expert	21.58
	Government worker	38.17

	Vagla	0.41
	Kasina	0.41
	Frafra	0.41
	Fante	0.41
	Ga	0.83
Ethnicity	Birfor	1.24
	Ewe	1.66
	Asante	2.49
	Sissala	6.22
	Wala	12.45
	Dagaaba	73.44
Monthly income	≤ GH¢2000.00	47.72
	< GH¢2000.00	52.28

Respondents in this study indicated the religion they belong. The results show that respondents were either Christian (77.59%), Muslim (16.18%) and Traditionalist (6.22%). The result demonstrated that majority (59.75%) of the respondents were married suggesting that the consumption of grasscutter meat is popular in family settings. This was followed by respondents who were never married (26.97%) also suggesting that many young couples and single respondents often eat out probably suggesting as a result of their tight work schedules.

Consumers of grasscutter meat appeared to be associated with educational level as a majority (86.72%) had basic education up to tertiary education. Among those with educational background, about 42% had tertiary education followed by secondary education of about 27%. The respondents who had no formal education constituted only 13.28%.

The primary occupation of respondents was categorised into government worker, technical expert, farmer, trader or other (bartender, cleaner, student etc.). About 38% work for the government of Ghana in various fields. Respondents who were primarily farmers constituted about 15% while traders constituted the least percent response value of about 12%. The result therefore suggests that government workers consumed grasscutter meat most. This may be because they are able to afford the meat due to the

earning of monthly income as compared to the other groups. Monthly income was categorised into those whose monthly income was less than GH¢2000.00 and those who earned a monthly salary above GH¢2000.00. The result shows that a majority (52.28%) of respondents earn a monthly salary above GH¢2000.00 while 47.72% earned GH¢2000.00 or less.

The result shows heterogeneity of ethnicity among respondents. Eleven different tribes were identified among respondents. The Dagaaba ethnic group constituted the majority (73.44%) followed by the Wala (12.45%) and the Sissala (6.22%). These three ethnic groups are the majority ethnic groups in the Upper West region. The other eight ethnic groups constituted about 8%.

Table 5.2 displays the descriptive statistics of continuous variables such as age, number of dependents and household size of respondents. The minimum and maximum number of dependents and household size were one and thirty-two respectively. The average number of dependents for a respondent was about 6.0 which means that every six members of the family depend on one member while the average household size was 4.0.

Table 5.2: Descriptive statistics of continuous variables of respondents

Socio-economic characteristic	Minimum	Mean	Maximum	SD
Age	18	37.53	79	10.85
Number of dependents	1	5.63	32	4.18
Household size	1	4.00	32	3.61

5.3 Preferences for Grasscutter Meat over Other Meat Types

Figure 5.1 shows a graphical presentation of the positive responses of respondents' preferences for grasscutter meat over other meat. The result shows that about 92.0% of consumers said they would prefer grasscutter meat over other meat if it is available.

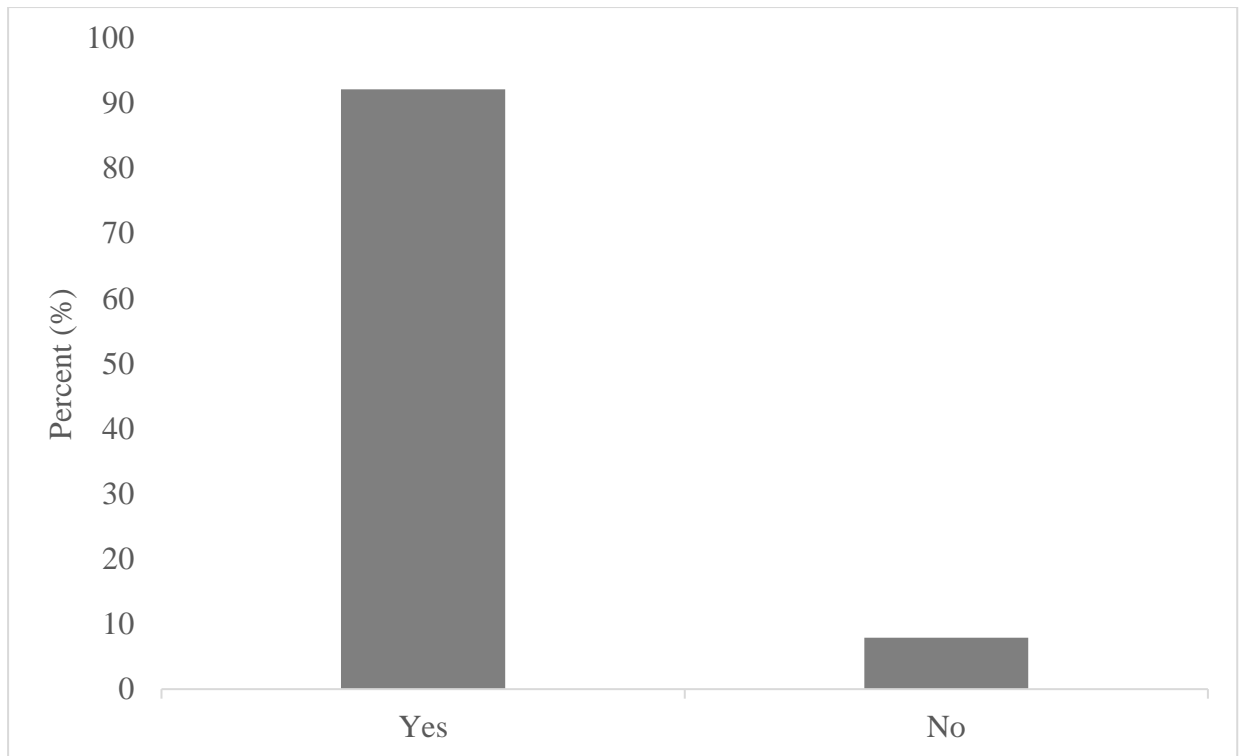


Figure 5.1: Preference for grasscutter meat over other meat

5.4 Willingness to Pay Decision for Grasscutter Meat

The average cooked piece of bushmeat in chop bars at the time of data collection was GH¢ 7.00. Using the DBDC questions, the respondent was first asked the general question: ‘Are you willing to pay more for grasscutter meat than the other conventional meat?’ The respondent had to answer either ‘yes’ or ‘no’. A ‘yes’ response was then followed by another question with a predetermined percentage (20%, 50%, 120%). If the respondent answered ‘yes’ to the first bid, a second higher bid was presented to decide on whether to pay or not. If the respondent answered ‘no’ to the first bid, a second lower bid was presented. The possible combination of responses was a no-no (n/n WTP), no-yes (n/y WTP), yes-no (y/n WTP), and yes-yes (y/y WTP). The segment of consumers who were not willing to pay more for grasscutter meat was assigned zero WTP.

About 86.0% (Figure 5.2) of the respondents said they were willing to pay more for grasscutter meat over other meat while about 14.0% were not willing to pay more for grasscutter meat.

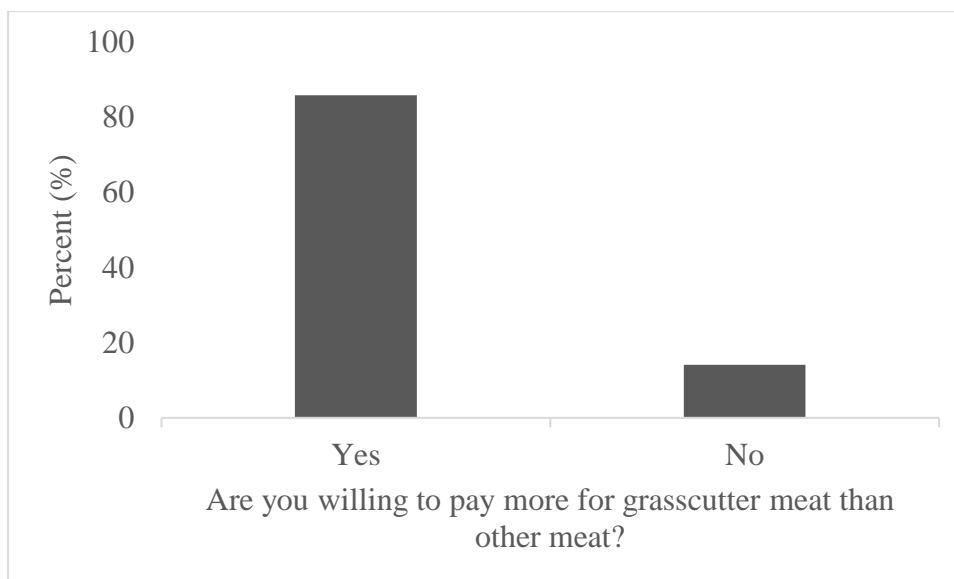


Figure 5.2: WTP for grasscutter meat decision

Table 5.2 presents reasons for not preferring grasscutter meat over other meat. The reasons for consumers who had little preference for grasscutter meat over conventional meat were fear of infection, grasscutter meat does not taste different from other meat and grasscutter meat is more expensive than other meat.

Table 5.3: Reasons for not WTP for grasscutter meat over other meat (N=34)

Reason	Frequency	Percent (%)
Fear of infection	2	70.59
Grasscutter meat does not taste different from other meat	8	23.53
Grasscutter meat is more expensive than other meat	24	5.88

5.5 Consumer Responses to Different Premium and Discount Price Levels

Table 5.4 shows respondents' responses to different premium discount price levels. The acceptance rates of each bid value were quite high ranging from about 77% at a bid value of GH¢ 10.50 to about 56% at a bid value of GH¢ 15.4.

Table 5.4: Consumer responses to different premium and discount price levels (GH¢)

WTP (%)	50% premium (%)	20% discount (%)	120% premium (%)
Yes (85.89)	186 (77.18)	205 (65.06)	134 (55.60)
No (14.11)	55 (22.82)	36 (14.94)	107 (44.40)

5.6 Mean Willingness to Pay Amount (MWTPA) for Grasscutter Meat

Table 5.5 presents MWTPA for grasscutter meat at restaurants or chop bars. The average amount consumers were willing to pay for grasscutter meat at chop bars was GH¢14.46 representing a 207.0% increase in the average cost of other bushmeat. The lowest MWTPA was GH¢ 2.00 while the highest MWTPA was GH¢ 30.00.

Table 5.5: Mean Willingness To Pay Amount (MWTPA) for grasscutter meat

MWTPA (GH¢)	Standard dev.	Current market (GH¢) price	Minimum (GH¢)	Maximum (GH¢)
14.46	6.15	7.00	2.00	30.00

5.7 Factors Influencing WTP for Grasscutter Meat over other Meat Types

Table 5.6 presents a binary regression of factors influencing WTP for grasscutter meat over other meat. All factors have positive odds of consumers' WTP for grasscutter meat over other meat. The factor with the highest odds was nutrient quality of grasscutter meat at both the univariate [COR = 93.04 (95% CI = 27.63–313.29), p = 0.01] and multivariate model [COR = 26.86 (95% CI = 3.36–214.50), p = 0.01]. Apart from service quality and aroma all other factors were statistically significantly associated with consumers WTP for grasscutter at a 5% level of significance in the bivariate model. When all the factors interacted in the multivariate model, only softness [COR = 26.63 (95% CI = 5.58–121.07), p = 0.01] and nutrient quality of grasscutter meat were significant.

Table 5.6: Factors influencing WTP for grasscutter meat

Variable	Unadjusted			Adjusted		
	COR	p-value	95%CI	AOR	p-value	95%CI
Physical surrounding	4.93	0.01	1.47-16.55	2.25	0.61	0.10-48.76
Service quality	3.11	0.36	0.27-35.22	0.12	0.86	3.03-4.62
Location of food service	28.57	0.01	10.41-78.44	2.61	0.44	0.22-30.31
Availability of grasscutter meat	47.60	0.01	12.61-179.77	8.41	0.07	0.84-84.21
Taste	3.01	0.01	1.46-6.43	2.27	0.36	0.39-13.24
Soft/texture	39.00	0.01	15.23-99.86	26.6	0.01	5.58-121.07
Aroma	1.45	0.34	0.68-3.07	2.52	0.39	0.30-20.96
Loyalty to the food service	3.03	0.01	1.43-6.39	1.81	0.46	0.38-8.60
The healthiness of grasscutter meat	10.34	0.01	4.57-23.38	2.94	0.19	0.59-14.58
Nutrient quality of grasscutter meat	93.04	0.01	27.63-313.29	26.8	0.01	3.36-214.50

5.8 Socio-economic Determinants for WTP and Bid Levels for Grasscutter Meat

Some socio-economic variables were regressed on WTP and bid levels. The coefficients and standard errors are displayed in Table 5.7.

The result in Table 5.7 shows that the association between WTP and female consumers as well as the bid levels is negative and significant. The gender indicates that male consumers are WTP for grasscutter meat than female consumers. Also, male consumers are WTP for all the bid levels than female consumers.

The result shows a negative and non-significant relationship between WTP for bid 1 and bid 2 and Muslims as well as traditional worshippers. The religion of the consumers therefore indicates that Christians are WTP for grasscutter meat than non-Christians. The association was significant for traditional worshippers at bid 3.

There exists a negative and non-significant relationship between consumers who were never married, married, separated or single for bid 1 and bid 2 and WTP. This means that consumers who were divorced are WTP for grasscutter meat for bid 1 and bid 2 than their counterparts. The relationship was significant for consumers who were separated and WTP for bid 3.

The primary occupation of consumers positively correlated with WTP, bid 1 and bid 2 but the relationship was not significant. However, the association was significant for bid 3 indicating that consumers who were farmers were WTP for bid 3 compared to consumers of other primary occupations.

There was a positive correlation between the household of consumers and WTP for grasscutter meat. However, negative and significant relationship existed between household size of consumers and bids 1 and 2. This negative correlation shows that consumers with more members in a household were not WTP more for grasscutter meat.

There was a positive relationship between the number of dependents and WTP for grasscutter meat as well as the various bid levels. The relationship was significant at bid 1 and bid 3.

There was a positive correlation between consumers who had no basic education, those with secondary and tertiary education and WTP for grasscutter meat and bid 1. However, WTP decreases for bid 1 for consumers with secondary education and for bid 3 for consumers with no basic education and with secondary education. The relationship was positive for consumers who had tertiary education and significant for bid 1.

The result shows a negative and non-significant correlation between age and WTP for bids 1, 2 and 3. This means that as age decreases, WTP for grasscutter meat and the various bid levels decrease.

The result indicates a positive non-significant association between monthly income and WTP for the all-bids levels. Thus, consumers with more income are WTP for grasscutter meat and also for all bids though the association was not significant.

Table 5.7: Estimated coefficients of selected socio-economic variables on WTP and various premium bits for grasscutter meat

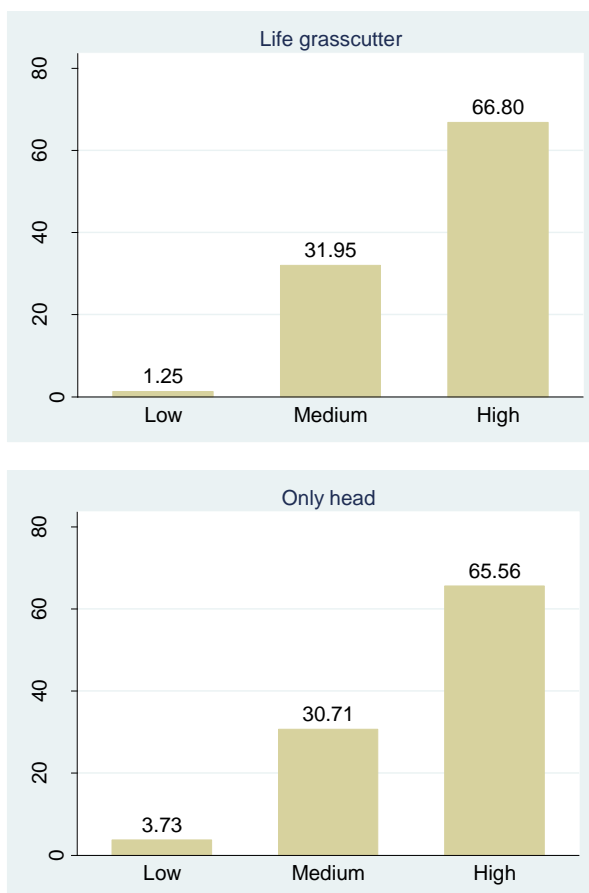
	WTP		Bid 1		Bid 2		Bid 3	
	Coef.	St. Err.	Coef.	St. Err.	Coef.	St. Err.	Coef.	St. Err.
Gender								
Male (REF)								
Female	-1.25**	0.51	-1.85**	0.54	-1.45**	0.431	-1.15***	0.40
Age (continuous)	-0.03	0.03	-0.03	0.03	-0.01	0.24	-0.01	0.02
Marital status								
Married (REF)								
Separated	-0.80	1.41	-1.04	1.48	0.01	1.08	-2.09*	1.17
Widowed	-1.83	1.50	-1.90	1.63	-0.43	1.17	-0.01	1.08
Never married	-0.93	1.27	-1.11	1.32	0.74	0.96	0.18	0.90
Divorced	-0.03	1.23	-0.03	1.31	0.66	0.89	-1.16	0.83
Religion								
Christianity (REF)								
Islam	-0.69	0.54	-0.08	0.62	0.24	0.49	0.20	0.42
Traditional	-0.78	0.10	-0.58	0.97	-0.48	0.80	-1.59**	0.71
Education level								
Basic education (REF)								
No basic education	1.64	1.06	1.58	0.97	0.74	0.77	-0.56	0.66
Secondary education	0.12	0.62	0.26	0.63	-0.08	0.53	-0.03	0.48
Tertiary education	0.61	0.64	1.56**	0.71	0.47	0.53	0.47	0.46
Household size (continuous)	0.14**	0.06	-0.14*	0.07	-0.12**	0.06	-0.05	0.05
Number of dependents (continuous)	0.07	0.09	0.18**	0.10	0.13	0.08	0.20**	0.07
Monthly income								
<GHC2000.00 (REF)								
>GHC2000.00	0.04	0.54	0.18	0.58	0.18	0.44	0.36	0.38
Occupation; Other (REF)								
Farmer	1.59	1.17	0.24	0.94	1.41	0.87	1.23*	0.66
Constant	3.61	1.78	2.91	1.82	0.88	1.44	-0.28	1.31

**

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

5.9 Preferred Portion Cuts for Grasscutter Meat

Figure 5.3 shows the preference for life grasscutter and choice or portion cuts of grasscutter meat by consumers. The four attributes (life grasscutter, only the head of grasscutter, only the thighs of grasscutter and only the innards of grasscutter) were listed for consumers to rate on a three-point scale (1 = low preference, 2 = medium preference and 3 = high preference). The majority of the consumers rated high preference for all the attributes. Among all the attributes, preference for ‘only thigh of grasscutter’ (72.20%) was the highest preferred choice cut while preference for ‘only innards’ (64.31%) of grasscutter was the least preferred choice cut.



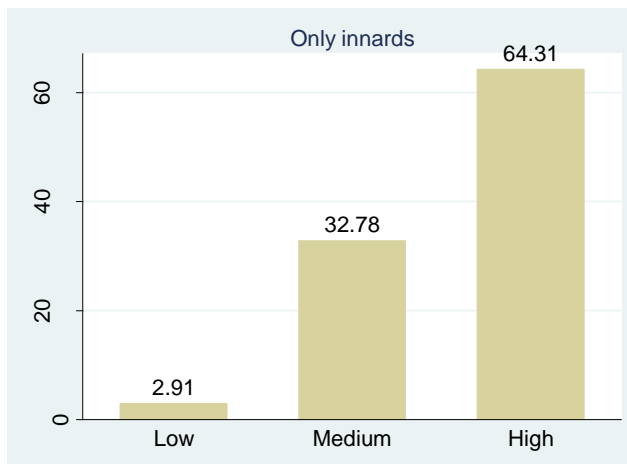
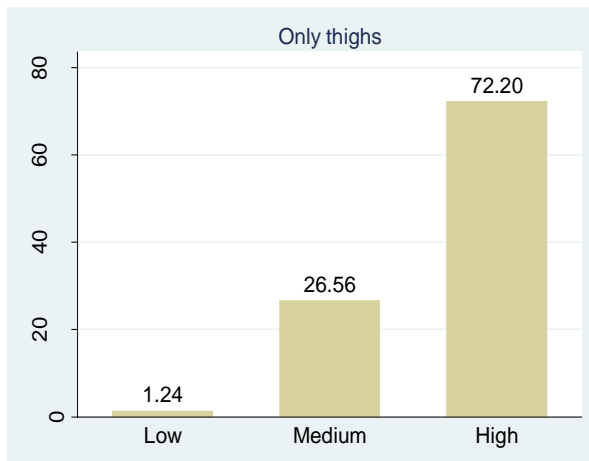
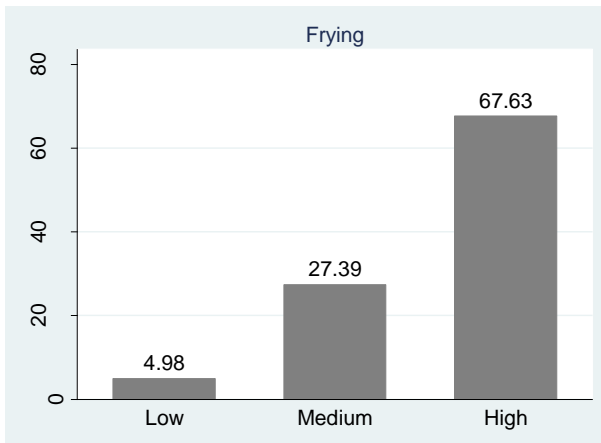
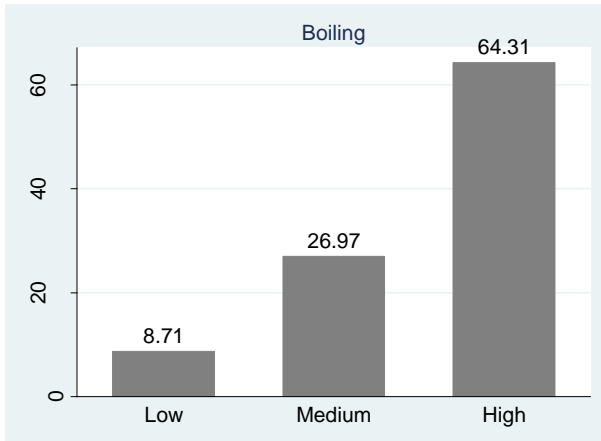


Figure 5.3: Preferred choice cuts for grasscutter meat

5.9.1 Preferred Cooking Method for Grasscutter Meat

Figure 5.4 also illustrates consumers' preference for cooked grasscutter meat. The result shows that consumers' preference for all the cooking methods was high with grilled grasscutter meat (65.15%) as the most preferred among all the other cooking methods. Consumers rated roasted grasscutter meat (59.76) as the least preferred cooking method.



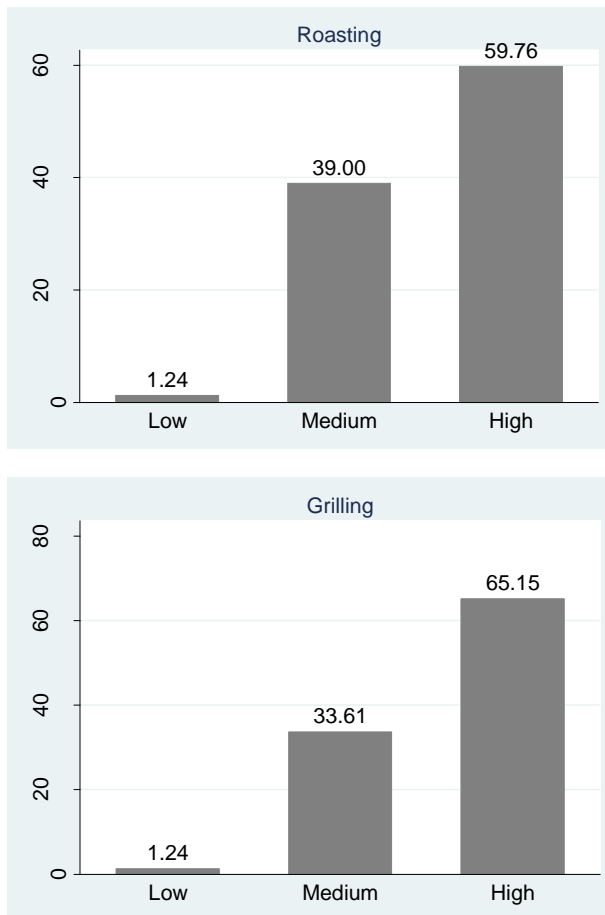
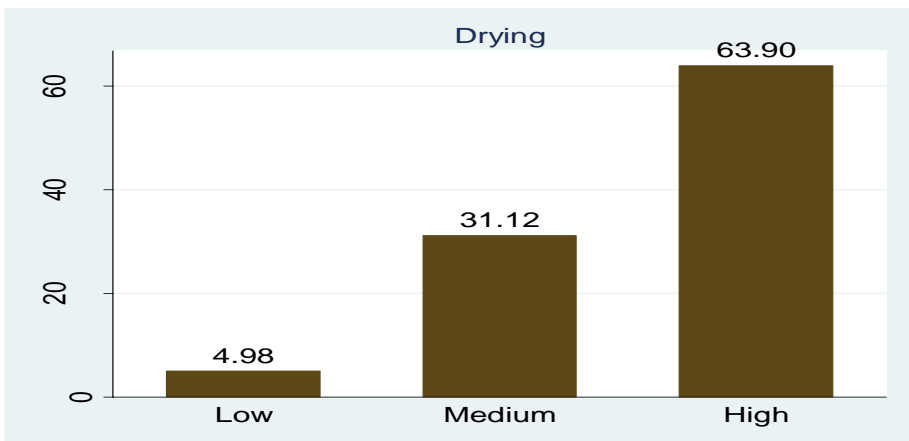
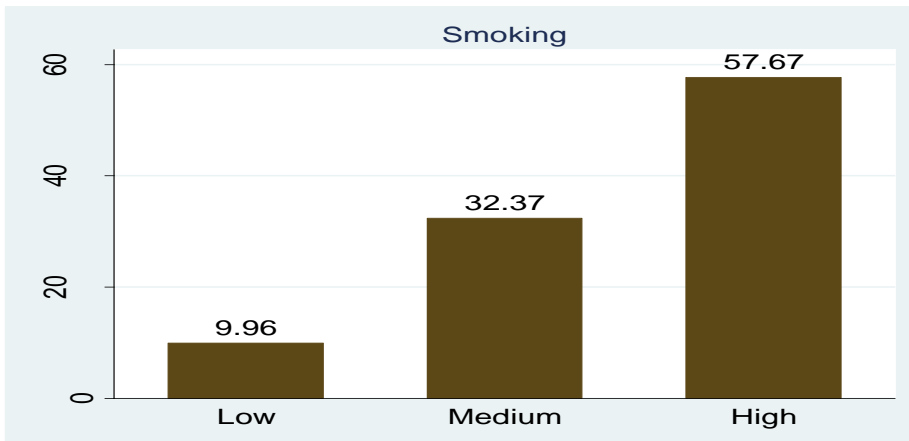


Figure 5.4: Preferred cooking method for grasscutter meat

5.9.2 Preferred Processing Method for Grasscutter Meat

Consumer preferences for processing or preservation methods are shown in Figure 5.5. A majority of the consumers preferred dried grasscutter meat (63.90%) as the most preferred processing and preservation method and rated vacuum packing (48.55%) as the least preferred processing and preservation methods.



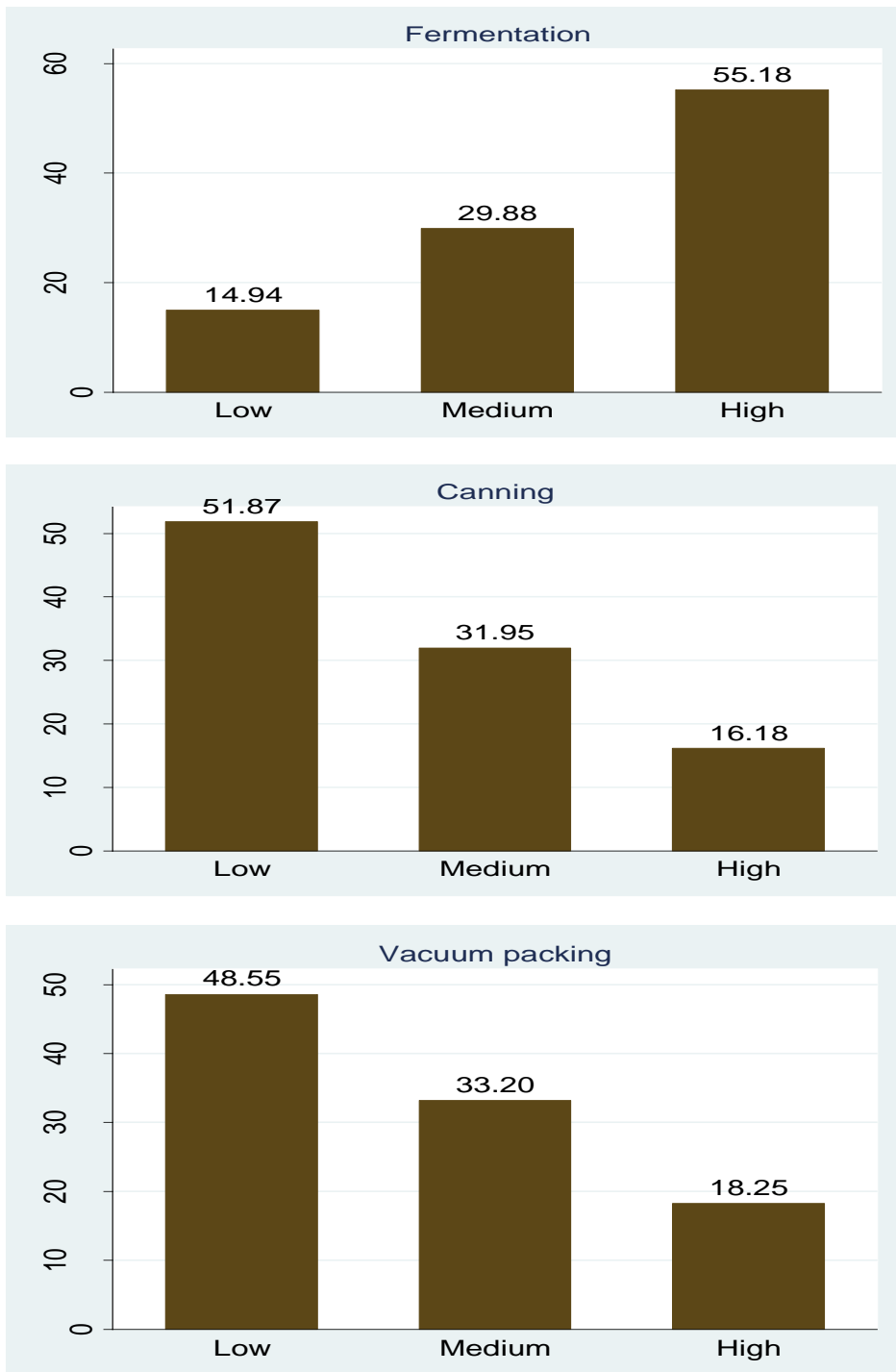


Figure 5.5: Preferred processing method for grasscutter meat

5.9.3 PCA results for Preference for Portion Cuts and Processing/Preservation Method

Preferences for consumers' choice of cuts and processing or preservation method for grasscutter meat were analysed. Principal components analysis was performed and ordered probit logistic regression was used to estimate consumers' preference for this objective. The variables considered for the principal components analysis were preference for 'life grasscutter', 'only the head of grasscutter', 'only the intestines of grasscutter', 'canning' and 'vacuum packing'.

5.10 Unrotated Principal Components Correlation

Table 5.8 shows the unrotated components. The result shows that two components had Eigen values greater than one and accounted for about 78% of the variance being 2.467 and 1.437 respectively. It shows the proportion or commonalities of variance that each variable has in common with another. If the proportion is high, it means the extracted component explains a huge portion of the variable variance. The total variance explained is greater than the 50% total variance as recommended by Dogbegah et al. (2011).

Table 5.8: Principal components correlation; Rotation: (unrotated = principal)

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	2.467	1.030	0.493	0.493
Comp2	1.437	0.896	0.287	0.781
Comp3	0.541	0.253	0.108	0.889
Comp4	0.288	0.022	0.058	0.947
Comp5	0.266	.	0.053	1.000

Pallant (2011) also demonstrated that a plot of the eigenvalues can further show the number of components to retain. A plot of the eigenvalues in Figure 5.6 shows that two components actually expressed maximum component loadings. There was an elbow curve at the third component which suggested that all components from the elbow have eigenvalues less than one and therefore should be excluded.

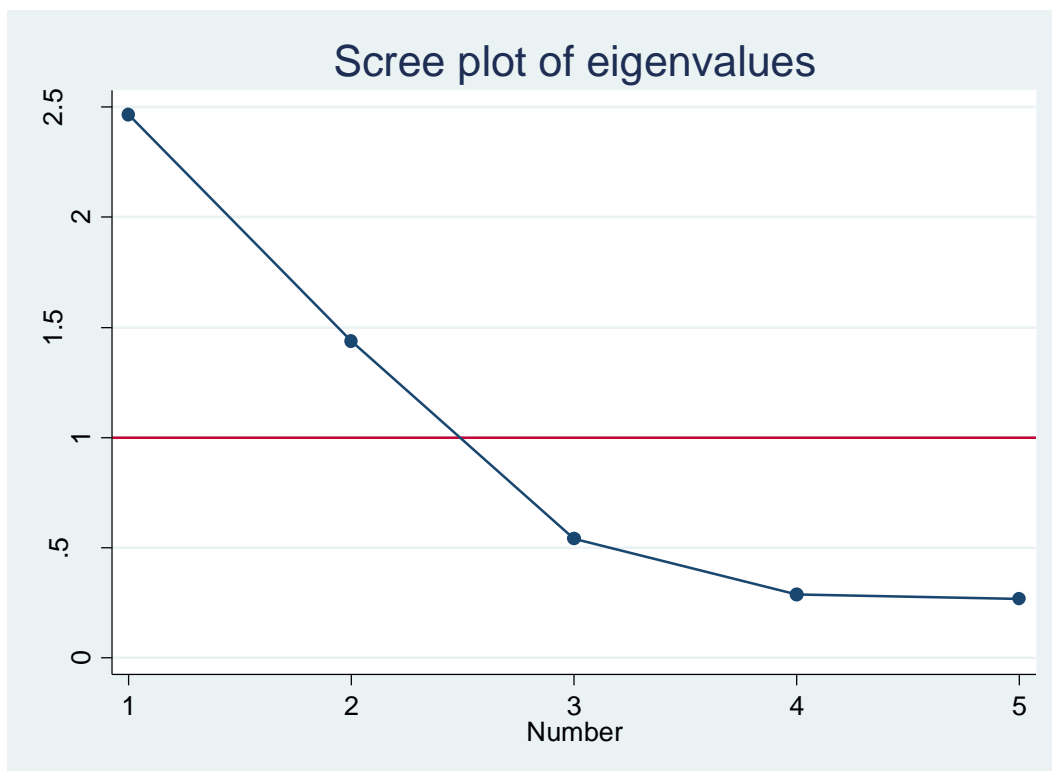


Figure 5.6: Scree plot of Eigen values

5.10.1 Principal components (eigenvectors)

Based on the evidence of obtaining a higher value than the recommended, the two components were therefore retained in this study because they significantly represented the data set. Table 5.9 shows the various variables and their eigenvectors. The highest eigenvector was component four loaded on ‘only innards’ of grasscutter.

Table 5.9: Principal components (eigenvectors)

Variable	Comp1	Comp2	Comp3	Comp4	Comp5	Unexplained
Life	0.573	-0.060	-0.012	-0.515	0.634	0
grasscutter						
Only head	0.575	-0.062	-0.016	-0.291	-0.762	0
Only innards	0.536	-0.266	0.136	0.780	0.126	0
Canning	0.115	0.696	0.708	0.034	0.002	0
Vacuum	0.200	0.662	-0.692	0.203	0.034	0
packing						

5.10.2 Correlation matrix

The matrix of correlation is indicated in 5.10 which shows that the components are uncorrelated with each other.

Table 5.10: Matrix of correlations

Variables	(1)	(2)	(3)	(4)	(5)
(1) Life grasscutter	1.000				
(2) Only head	0.733	1.000			
(3) Only innards	0.686	0.692	1.000		
(4) Canning	0.093	0.092	-0.053	1.000	
(5) Vacuum	0.206	0.207	0.008	0.455	1.000

5.10.3 Pairwise correlation

Pairwise analysis (Table 5.11) was conducted on the components and the result shows that a significant relationship existed between ‘only the head’ and component one, ‘only innards’ and that of components one and two and ‘vacuum packing’ and components one, two and four.

Table 5.11: Pairwise correlation

Variables	(1)	(2)	(3)	(4)	(5)
(1) Life grasscutter	1.000				
(2) Only head	0.733 (0.001)	1.000			
(3) Only innards	0.686 (0.001)	0.692 (0.001)	1.000		
(4) Canning	0.093 (0.148)	0.092 (0.155)	-0.053 (0.410)	1.000	
(5) Vacuum packing	0.206 (0.001)	0.207 (0.001)	0.008 (0.897)	0.455 (0.001)	1.000

5.10.4 Principal Components (eigenvectors)

Table 5.12 shows the component loadings at values <0.3 . the loadings revealed two principal components. The items for components one were ‘life grasscutter’, ‘only head’ and ‘only innards’. The items representing component two were ‘canning’ and ‘vacuum-packing’.

Table 5.12: Principal components (eigenvectors) (blanks are abs(loading) <0.3)

Variable	Comp1	Comp2	Unexplained
Life grasscutter	0.573	-0.060	0.184
Only head	0.575	-0.062	0.179
Only innards	0.536	-0.266	0.190
Canning	0.115	0.696	0.272
Vacuum packing	0.200	0.662	0.272

5.10.5 Orthogonal varimax rotation

The components were rotated orthogonally using the varimax rotation technique (Table 5.13). The varimax rotation was to find components that were easier to explain and to ensure that the components were uncorrelated (Lecavalier, 2010).

Table 5.13: Orthogonal varimax rotation (blanks are abs(loading) <0.3)

Variable	Comp1	Comp2	Cumulative
Life grasscutter	0.572		0.184
Only head	0.574		0.179
Only innards	0.582		0.190
Canning		0.704	0.272
Vacuum packing		0.690	0.272

5.10.6 Component rotation matrix

After the varimax rotation technique, two components were extracted which accounted for about 78% of variance from all the initial five variables (Table 5.14).

Table 5.14: Component rotation matrix

Component	Variance	Difference	Proportion	Cumulative
Comp1	2.415	0.926	0.483	0.483
Comp2	1.489	.	0.298	0.781

5.10.7 Kaiser-Meyer-Olkin measure of sampling adequacy

Table 5.15 shows the KMO values for each variable, the overall KMO value and reliability values. The overall KMO value was 0.699 which is greater than 0.500 as the recommended value for principal component analysis data feasibility. The first component with variables ‘life grasscutter’, ‘only head’ and ‘only innards’ was named ‘choice cuts’ which has a reliability value of 0.876. The variables namely ‘canning’ and ‘vacuum packing’ constituted the second component and was named as ‘processing and preservation method’ with a reliability value of 0.626.

Table 5.15: Kaiser-Meyer-Olkin measure of sampling adequacy

Variable	KMO value	Alpha value
Choice cuts (component 1)		
life grasscutter	0.740	
head	0.734	
Innards	0.727	
		0.876
Processing method (component 2)		
Canning	0.546	
Vacuum	0.544	0.626
Overall KMO	0.699	0.651

5.10.8 Ordered probit model results of factors influencing consumers’ preferences for choice cuts and processing/preservation methods for grasscutter meat

Table 5.15 displays the result of ordered logistic regression of factors influencing choice cuts (life grasscutter, only head, only innards) and processing/preservation method (canning and vacuum packing). There was a positive and significant

relationship between the number of dependents and preference for life grasscutters. There was an inverse relationship between Muslims and preference for canned grasscutter meat when Christians was made the reference category. This means that Christians would prefer canned grasscutter compared to Muslims. The reason may be that Muslims may consider canned grasscutter as not Halal since they could have doubts about the killing method. A negative and significant correlation existed between no basic education and preference for canned grasscutter meat with no education as the reference category. This means that consumers who had no basic education would not prefer canning grasscutter meat as a processing method compared to those who had basic education. Vacuum packing of meat products is not common in Ghana especially, at the study location. Under religion, Christians would prefer vacuum packing method compared to Muslims and consumers from the Ashanti region preferred vacuum packing less when compared with consumers in the Central region. Under education, all the categories showed that consumers with no basic education, secondary and tertiary education preferred grasscutter meat more than consumers with basic education. The result was significant for consumers with no basic education and with tertiary education. There were positive and significant relations between the number of dependents, household size and preference for vacuum-packed grasscutter meat. That is to say as the number of dependents and household size increase, preference for vacuum-packed grasscutter meat will increase.

Table 5.16: Ordered probit model results of factors influencing consumers' preferences for portion cuts and processing/preservation methods for grasscutter meat

Variable	Choice cuts			Processing and preservation method	
	Life	Head	Innards	Canning	Vacuum packing
	Coef.	Coef.	Coef.	Coef.	Coef.
Gender					
Male (REF)					
Female	0.362	0.009	-0.59	0.371	0.852**
Age (continuous)	0.005	0.020	0.004	0.007	0.003
Religion					
Christian (REF)					
Muslim	0.040	-0.183	0.248	-0.804*	-1.315**
Traditional	-.0234	-0.567	-0.613	-0.612	0.452
Marital status					

Divorced (REF)					
Married	0.187	-0.388	-0.691	0.351	1.030
Never married	0.417	-0.111	-0.496	0.329	0.985
Separated	-0.687	-0.425	-1.368	1.197	1.504
Widowed	0.363	-0.144	-0.177	1.480	1.609
Region					
Ashanti region (REF)					
Central	-4.579	-2.580	-2.481	1.526	-3.543*
Greater	17.103	16.181	15.801	1.437	-2.177
Savanah	-22.009	-18.837	-18.832	5.761	-2.661
Upper East region	16.391	14.818	14.862	19.907	-1.346
Upper West region	-2.305	-1.442	-1.834	-13.237	-1.241
Volta region	1.428	1.082	1.333	1.938	0.506
Ethnicity					
Akan					
Birfor	20.203	17.803	17.901	14.04	-0.238
Dagaaba	3.178	2.391	2.581	14.816	-0.724
Frafra	0.797	1.688	0.810	1.630	19.578
Sissala	3.641	2.190	3.500	13.847	-1.615
Vagla	19.473	17.744	17.423	0.704	-13.466
Wala	2.75	2.530	2.460	15.242	-0.176
Education					
Basic education (REF)					
No basic	0.354	0.257	0.747	-1.368**	-1.310**
Secondary	0.134	0.121	0.087	0.171	-0.207
Tertiary	-0.044	-0.221	-0.417	-0.711	-0.784*
Occupation					
Other (REF)					
Farmer	0.493	0.678	0.749	1.076*	2.266***
Number of dependents (Continuous)	0.163**	0.072	0.048	0.030	0.045
Household size (Continuous)	-0.041	-0.032	-0.067	0.058	0.091**
Monthly income					
<GHC2000.00 (REF)					
2000 +	-0.203	0.272	-0.093	0.043	0.774**

*** $p < .01$, ** $p < .05$, * $p < .1$

5.11 Chapter Summary

The Chapter highlights the preferences and WTP for grasscutter meat at eateries. It revealed that consumers generally prefer and are willing to pay for grasscutter meat

compared to other alternative meat products. It also demonstrated that the physical surroundings of the food service joint, location of the food service joint, availability of grasscutter meat in the food service joint, taste, softness or texture, loyalty to the food service, healthiness and nutrients quality of grasscutter are the major factors influencing consumers' WTP for grasscutter meat. The Chapter also revealed two principal components that influence consumer preference for grasscutter meat. These components include choice cuts of grasscutter meat and processing or preservation methods for grasscutter meat. The results revealed significant relationship between gender, religion, education, region, number of dependents, household size and monthly income and preference for grasscutter meat for the two principal components from the PCA analysis.

CHAPTER SIX
CAUSES FOR FOLDING UP, PARTNERSHIP, INSTITUTIONAL SUPPORT
AND POLICIES FOR GRASSCUTTER PRODUCTION IN THE UPPER
WEST REGION

6.1 Introduction

This chapter presents the findings of causes that led to some farmers folding up in grasscutter production and the effectiveness of institutional support and policies for grasscutter production. It addresses research question four and objective four. Figure 6.1 shows the thematic map used for the analysis of this objective.

6.2.1 Partnership and policy support for livestock and grasscutter production

The result from the qualitative data obtained from unsuccessful grasscutter farmers indicate that all of them obtained their breeding stock from GGP through GIFT (Figure 6.1). GGP introduced grasscutter rearing in the region in 2014 and farmers signed a written agreement to give back breeding stock to GIFT after a successful production for onward introduction to other interested farmers in the district or municipality. Plate 6.1 shows the agreement sheet farmers signed for grasscutter breeding stock. Also, GIFT was the main partner for all the farmers. However, many of the farmers said they also partnered with their family members at the household level to take care of the grasscutters. Also, GIFT partnered with MoFA livestock officers, grasscutter farmers, meat processors, input dealers and consumers by giving them training through workshops but the partnership is weak as these actors have no direct influence on farmers' management practices of grasscutters. Generally, the livestock department of MoFA is to develop and promote poultry and livestock production in the country for food security. They partner with NGOs such as the United States Agency for International Development (USAID) and the Food and Agriculture Sector Development Policy (FASDEP II). Unfortunately, grasscutter production is not prioritized in their policy. All the farmers belonged to a cooperative network platform to learn more about grasscutter production from colleagues and researchers. These actors include grasscutter farmers, input dealers, processors and consumers which is managed by GIFT. When farmers were asked about the kind of support they received from their partners, one farmer remarked as follows:

“I was given the grasscutters (three females, two males, a two-tier cage, water troughs and pelleted feed in 2015. During the period that the animals were introduced to me, I had massive support from GGP, family members and colleague farmers in my community to enable me to take care of the grasscutters. GfT supervised the animals on a monthly basis and advised me on the necessary production activities. They also organized workshops for us to get trained on aspects of grasscutter production. They sometimes supplied pelleted feed and catchers to me when I asked for them. For my family, my first son has been of great help by fetching feed from the river, especially in the dry season to feed the grasscutters. Sometimes, my wife also supported me with feed like brewers spent, water, maize and machine waste during the four years that I reared grasscutters. Some time ago, the Agric officer in Jirapa came around to check on other animals and gave injections when necessary but did not attend to the grasscutters. Unfortunately, all of them died in 2019 which I suspect feed poisoning from weedicide used in spraying the field where I usually harvested grasses from. I don't know but when I opened the stomach, the liver was black. So, the sudden death could be feed poisoning” (Telephone conversation with 51-year male grasscutter farmer, Duori, Jirapa Municipality on July, 2023).

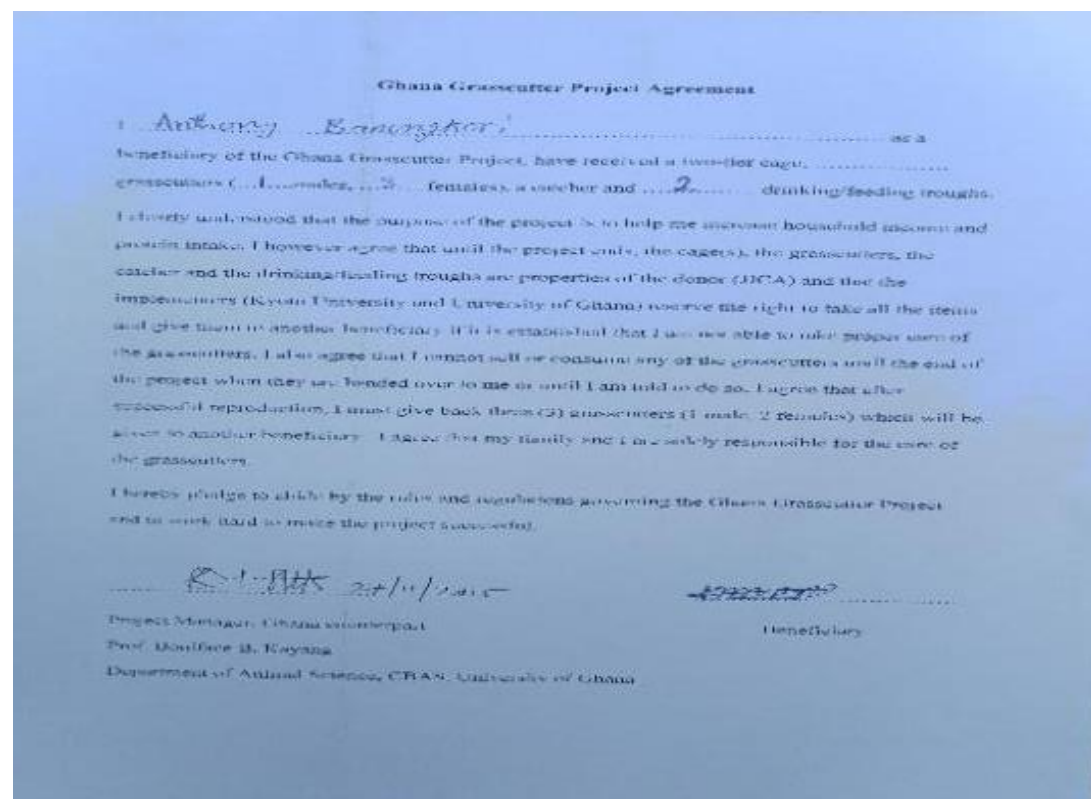
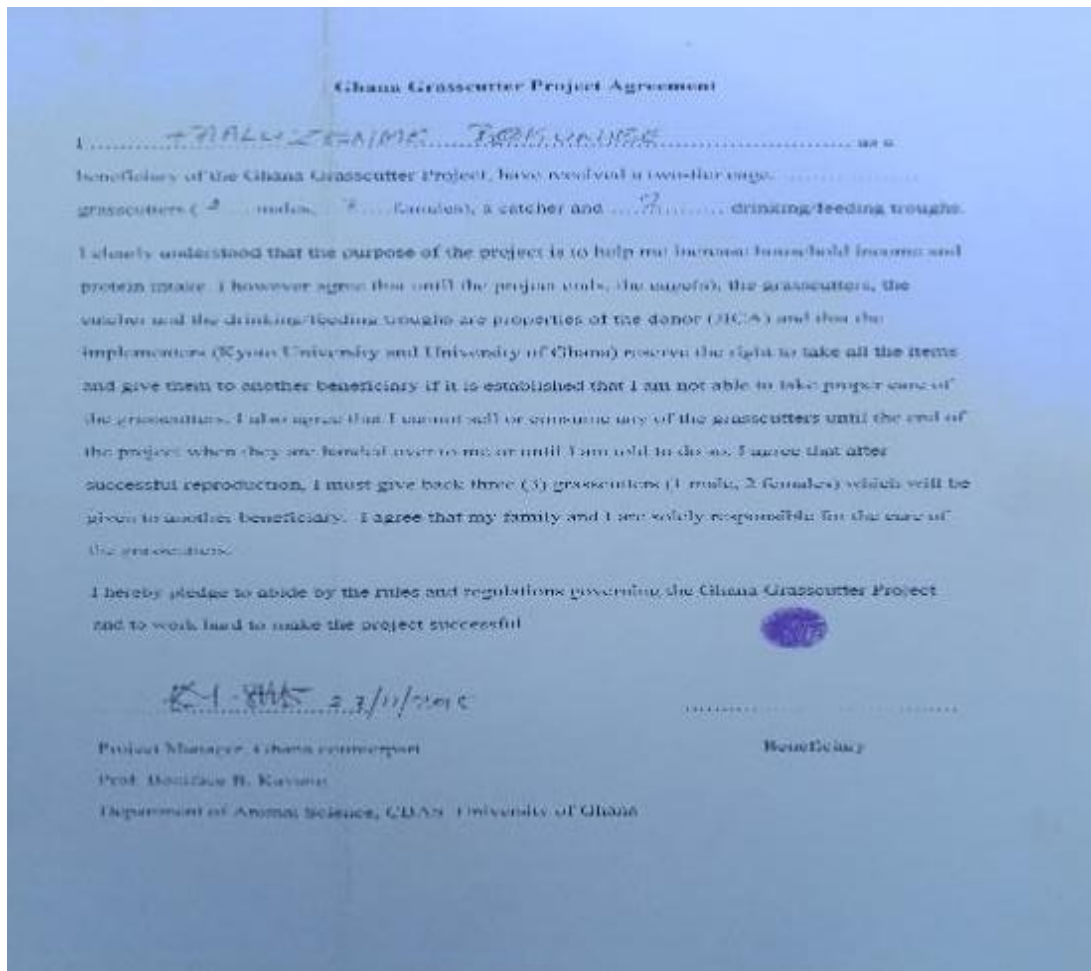


Plate 6.1: Agreement statement between GGP and grasscutter farmers.
 Source: Field observation, 2023

Questions were posed to a district director on institutional support and policies for livestock and grasscutter farmers and the kind of support given to the farmers and this is what he said:

“The Department of Agriculture primarily implements government policies regarding the livestock industry. The Divisions that handle the livestock industry are the Animal Production Unit and the Veterinary Service Unit. The first handles issues on livestock husbandry including; housing, feeding, breeding, hatchery, marketing, financing etc. The latter is involved with livestock health issues including; treatments and vaccination, movement and slaughter permits, ante-mortem and post-mortem examination etc. Yes, we partner with the District Health Management Team of the Ghana Health Service (GHS), Assembly members, Police, butchers, livestock and crop farmers, livestock input shops, livestock marketers among others. We have shared information with the GHS on rabies and anthrax. Assembly members facilitate in giving out orders for livestock to be confined at the beginning of the farming season. Meat inspection is done at the abattoirs and various slaughter slabs. Farmers are also been directed to input shops especially to Wa for livestock feed and other medication as there’s currently no livestock input shop in my district. Movement permits are issued out to people who buy livestock from livestock marketers, especially on Market Days. For vaccinations, announcements are made on the radio first, before the veterinarians embark on the exercise. Training on relevant livestock topics are also given to some selected livestock farmers. Under the Savannah Improvement Program (SIP), some livestock farmers received subsidized cockerels for rearing. They were to pay for the upfronts for the subsidized birds. We mapped out these farmers through stakeholder consultations. For example, through the Research and Extension Linkage Committee (RELC) meetings. Others are through yearly routine programs, especially with regards to vaccinations. Though, I have earlier been monitoring and participating in grasscutter production at the regional level and in other districts where beneficiaries’ farmers were located, I have since not seen someone keeping grasscutters in my current district. Unfortunately, the

Rearing for Food and Jobs did not include grasscutter, so there is no direct policy support to its production in the region” (Conversation with a District MoFA livestock officer, August 2023).

6.2.2 Knowledge of Agricultural Production

Agricultural activities that were practised in the districts or municipalities were crops, livestock rearing and fishing (Figure 6.1). The crops generally cultivated included cereals, tree crops, vegetables, legumes, roots, tubers, plantain and bananas. The cereals were varieties of maize, millet, rice and sorghum which were cultivated in all the districts or municipalities where farmers and livestock officers were interviewed. Vegetables cultivated included varieties of okro, tomatoes, pepper, garden eggs and kenaf. Tree crops included shea, mango and pawpaw. Beans, soya, groundnuts, bambara groundnuts and cowpeas were the major legumes cultivated. Yam, potatoes, cassava and plantain were also mentioned by farmers.

It was observed that different kinds of animals are reared in the districts or municipalities. Generally, the livestock raised in the district or municipalities were ruminants, poultry and pigs. Common ruminants were goats, cattle, sheep, rabbits, donkeys, guinea pigs and grasscutters. The poultry included guinea fowl, chicken, and ducks. Dogs, turkeys and pigeons were other livestock mentioned. Table 6.1 shows multiple responses on the kinds of animals largely reared in the farmers' district or municipality. No established fish farming existed in the communities visited. Fishing is a seasonal activity, especially in the dry season along rivers and the Black Volta. These are harvested using nets, baits and cutlasses for both family consumption and commercial purposes.

Table 6. 1: Multiple responses from on kinds of animals largely reared in the farmers district or municipality (N = 106)

Animal	Frequency
Goats	15
Sheep	14
Cattle	12
Donkey	5
Rabbits	3
Grasscutter	5
Guinea pigs	1
Chicken	15
Guinea fowl	8
Pigeon	4
Turkey	3
Ducks	3
Pigs	10
Dogs	6
Cats	3

6.2.3 Problems confronting Grasscutters and other livestock production

The major challenges to livestock production which farmers and livestock officers mentioned were difficulty in feeding their livestock during the dry season, epidemic outbreaks of diseases especially, for cattle, pigs and poultry and high mortalities of animals (Figure 6.1). Farmers lamented the low level of veterinary services available to them. Plate 6.2 shows a dead grasscutter and the visceral after evisceration. According to the knowledge of this farmer, the animal died of feed poisoning. When asked about how they treated their sick grasscutters, one of the farmers remarked as follows:

“Since the grasscutters were introduced, we were told by the monitoring officers not to give them any medication because the animals were still under study. In some of the visits, they added some medicine to the drinking water saying that it is to kill intestinal parasites. They, however, said we should add bioactive medicines such as the bark of the

neem tree, the bark of moringa or the bark of mango to the drinking water to kill worms in the stomach. The extension workers sometimes visited to check on my other animals and sometimes they gave them injection but they have never injected the grasscutters. They said they didn't know much about them, so they could not offer them medication. Sometimes, I unknowingly harvested grasses that had been sprayed with 'condemn' and they ended up killing the grasscutters because of the poison. The field workers said that when the liver is dark, it means it might have died from feed poisoning or some disease. The mortalities are high" (Fifty-five-year-old male farmer, Sissala East District, July 2023).

When the same question was asked to a district MoFA director, he said:

"Haphazard spraying of grasses with weedicide during the farming season which results in diarrhoea and sometimes death of the animals. Stealing, inadequate veterinarians, inadequate veterinary shops. Training of livestock farmers is only done occasionally as a measure to solve the situation. For instance, the use of radio to announce livestock vaccination such as Pest of Small Ruminants (PPR). Also, there is currently a proposal to USAID under the Resilience in Northern Ghana (RING II) Program to select and train 30 Community Livestock Workers to augment the work of the veterinary staff and livestock officers" (Conversation with a District MoFA livestock officer, August, 2023).

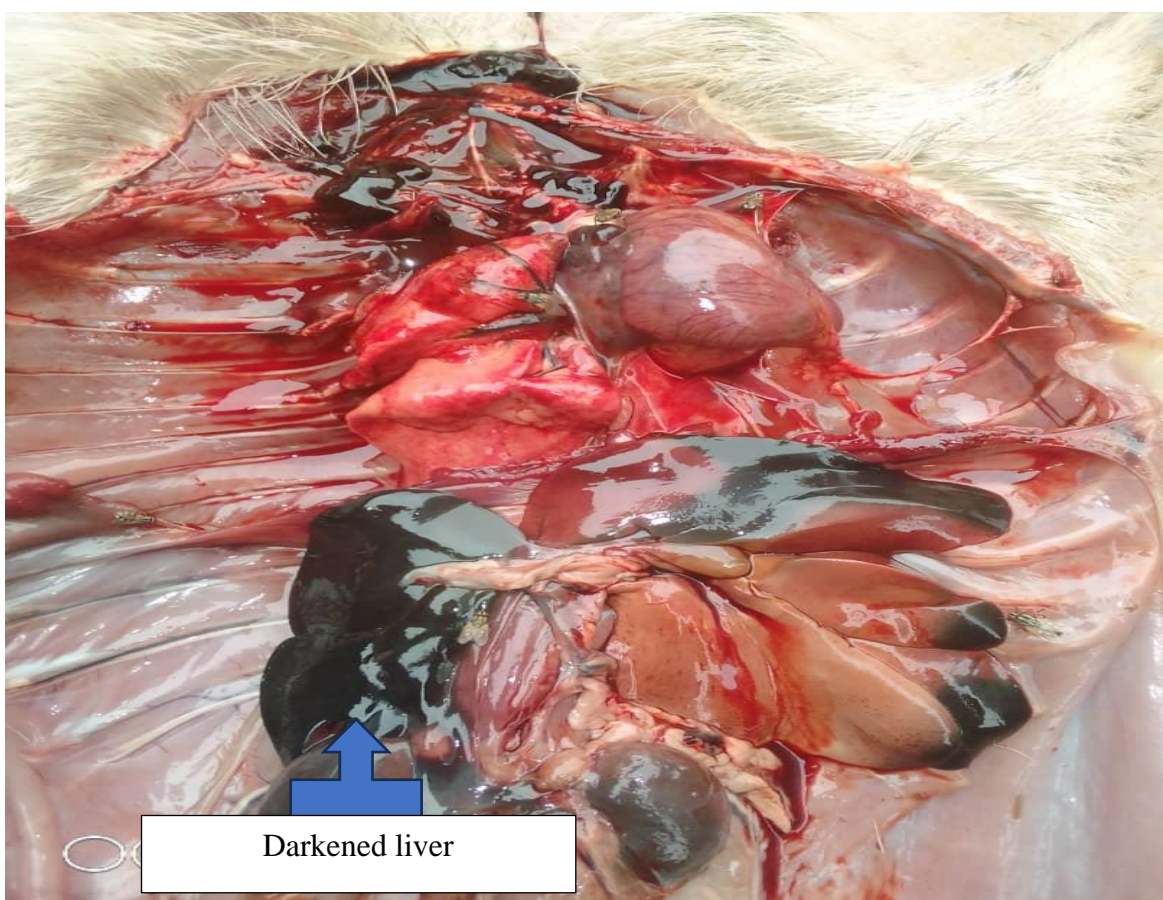


Plate 6.2: Sudden death of grasscutter perceived as feed poisoning

Source: Field observation, 2023

6.2.4 Grasscutter production information dissemination

Majority of the farmers reported that technical information such as feed requirement, sex determination, handling and environmental hygiene on grasscutter production was usually communicated to them by GiFT field officers and other project members (Figure 6.1). Though many of the information was disseminated through workshops, video

clips, manuals and posters, most of them were through phone calls and visits to the farmer's farm. Plate 6.3 shows some of the channels for disseminating grasscutter production information (a = guidelines; b = cartooned poster on grasscutter production; c = newsletter given to a farmer; d = manual on grasscutter production given to a farmer).

Many of the district livestock officers did not know much about how information is communicated to grasscutter farmers from their partner organization. All livestock officers who were interviewed had the opportunity to attend the grasscutter production workshop at least once since the project was implemented in the region through invitation by GGP but they were not formally introduced into grasscutter production activities and the key roles they should play. A district livestock officer said:

“After the animals were given to the farmers, we were not sufficiently active in the monitoring component of the grasscutter project, thus we are unaware of the present state of production and how the information is shared with farmers. Also, due to a paucity of success stories about grasscutter production, the Rearing for Food and Jobs initiative did not take grasscutter production into consideration. So, we need to sit with the NGO who is sponsoring the production of grasscutters in the region and see how we can effectively be involved” (Telephone conversation with a District MoFA livestock officer, August 2023).

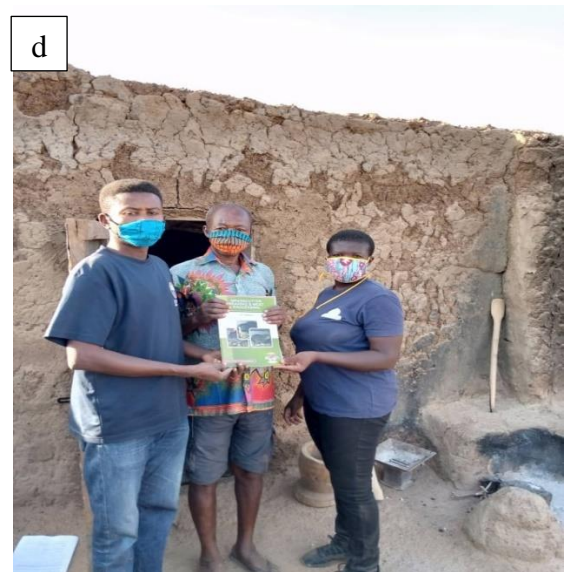
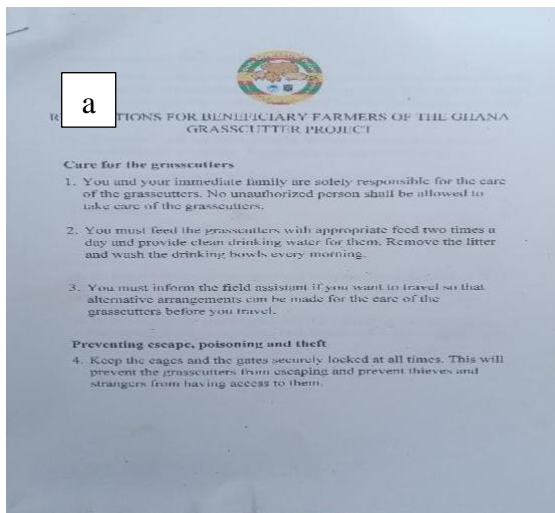


Plate 6.3: Grasscutter information dissemination

Source: Field observation, 2022.

6.2.5 Perceived risks in grasscutter farming

Farmers perceived risks included production risks such as losses of grasscutters as a result of sudden death, and feed constraints especially, in the dry season. Financial risks mentioned by farmers were high cost of feed for rearing grasscutters and other livestock and the high cost of putting up an appropriate housing system. Human personnel risks were inadequate knowledge on grasscutter production and little or lack of veterinary care for livestock and grasscutters respectively (Figure 6.1). When a farmer was probed on whether he perceived any risks in grasscutter production before they were given to him. He remarked as follows:

“Yes, I read about them before rearing, I learnt they easily die when not cared for properly, they get injured easily, they die when not fed well and they also have some common diseases like rabbits. Cold can also kill them. Also, they like eating maize but maize is now expensive making their production cost high” (37-years-old farmer, Wa Municipal, September, 2023).

A district director of the Ministry of Food and Agriculture remarked on the same question as follows:

“Yes. Inadequate knowledge on grasscutter rearing. Farmers who want to venture into grasscutter production should learn from those who are already rearing them” (Conversation with a MoFA official, August 2023).

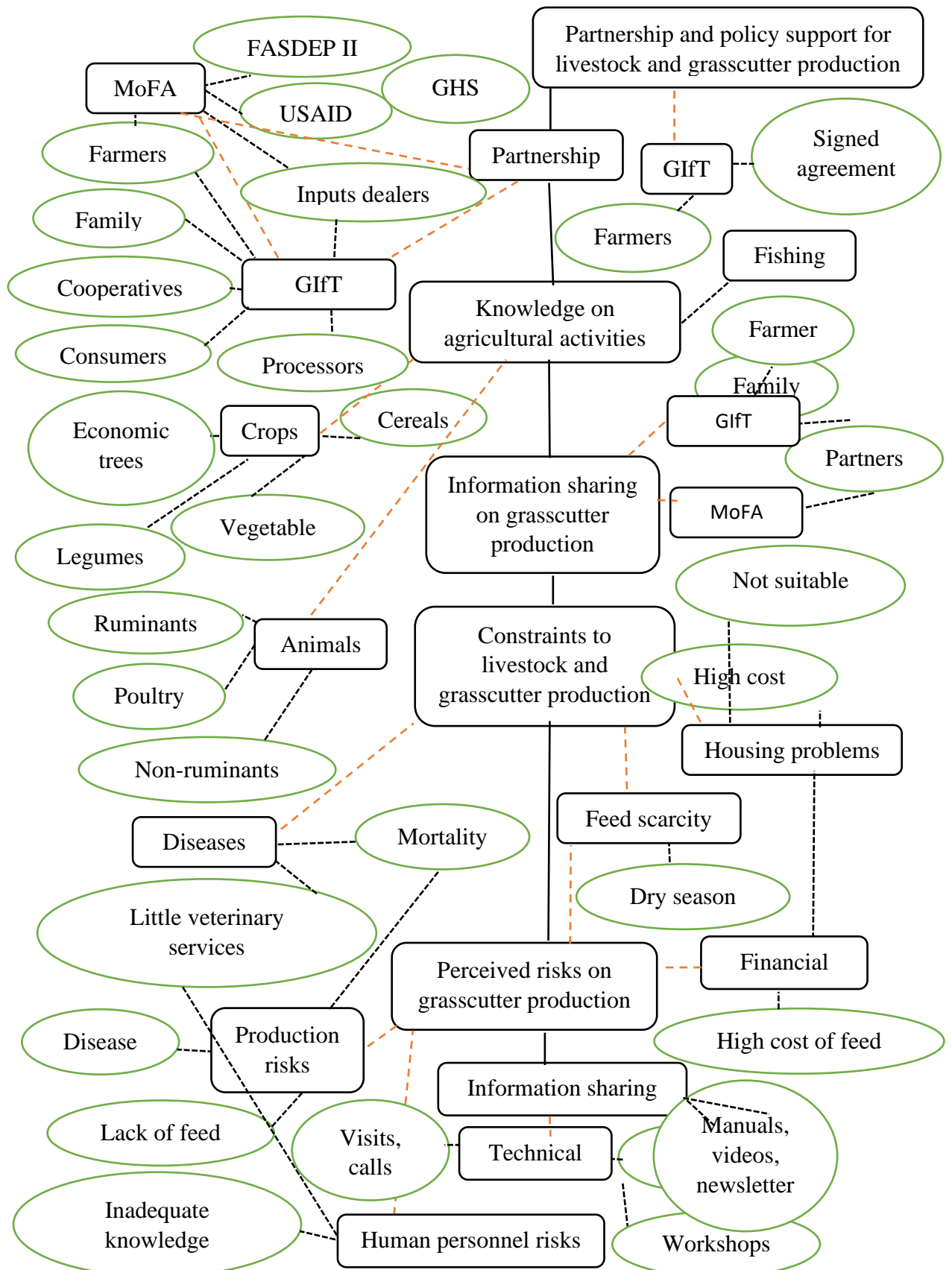


Figure 6.1: Thematic map illustrating seven major themes and sixteen sub-themes for causes of folding up, institutional support and policy in grasscutter production

Source: Author's construct, 2023.

6.2 Chapter Summary

This Chapter presents the qualitative approach of the study. The data shows that there is a weak partnership between GIFT and MoFA in supporting grasscutter production. Generally, farmers and livestock officers had good knowledge of the kinds of crops cultivated and kind of livestock reared in their districts or municipalities. The major problems to livestock and poultry production mentioned by livestock farmers were non-availability of feed, especially during the dry season, disease infections of animals and poor housing system. Technical information was disseminated to grasscutter farmers solely by GIFT field officers through workshops, videos, phone calls, posters and on-site visits. Farmers and livestock officers perceived three major categories of risks affecting livestock and grasscutter production which include production, financial and human personnel risks.

CHAPTER SEVEN

DISCUSSION OF MAJOR FINDINGS FROM THE STUDY

7.1 Introduction

This Chapter presents a discussion of the major findings from the study. The Chapter discusses the major findings about relevant literature. The study aimed to evaluate the risk and risk management of grasscutter farmers in the Upper West region, Ghana and assess consumers' preferences and WTP for grasscutter meat in the Wa Municipality. Particularly, the study aimed to investigate how grasscutter farmers experience risks, manage risks and engineer risk resilience in grasscutter production. Also, the study assessed factors influencing consumers' preferences and WTP for grasscutter meat at eateries. It also sought to investigate the causes that led to the folding up by some of the grasscutter farmers and investigate institutional support and policies for grasscutter production.

7.2 Farmers' Risk Attitudes, Concerns and Management Strategies

The finding from the study on the demographic characteristics showed that grasscutter farmers spanned across all the classified age groupings and the majority of the farmers (41, 78.8%) belonged to the economically active age group. The result indicates that many of the youth are going into agricultural activities to earn additional income. This is in accordance with the economically active working age in Ghana and supports the findings of Daudu et al. (2005), Folitse et al. (2020) and Dery et al. (2020).

Also, the study found that the majority of the farmers representing 78.8% were males. This may be due to the purposive distribution of grasscutters to more males than females by the GGP led by GiFT. The result could have been different if the beneficiaries were randomly selected as the population of females dominates the male population in the region according to the 2020 Population and Housing Census figures (GSS, 2020).

The study revealed that 84.6% of the farmers were married. This is important for the fact that many hands are needed to keep grasscutters as they require constant care by the family. The cooperation of couple and family members is therefore necessary for a

successful production. Also, the median values for the type of labour satisfaction show that grasscutter farmers were satisfied with family (4.00) and this was the same for the level of labour contribution in the grasscutter business. The result of family contribution agrees with the findings of Dery et al. (2020) where family cooperation was significantly associated with management practices and mitigating strategies to feed scarcity for successful grasscutter production.

The median values for treatment of diseases (2.0), prevention of diseases (2.0) and provision of drugs (2.0) were ranked as dissatisfied suggesting that veterinary services were lowly offered to the grasscutters. Findings by Delia et al. (2017) showed that rural farmers have limited access to animal health resources including education and medical needs. Studies in Kenya revealed that poor veterinary services are major livestock production challenges (Tim et al., 2002; Okwiri et al., 2002).

The study revealed that only social assets were possessed by all the farmers. This may be due to the numerous social activities that characterised rural life such as member associations or groupings. Folitse et al. (2020) measured human, natural, financial, social and physical capital on a five-point scale from very low to very high and found that all of the five assets improved the livelihood of grasscutter farmers. While their finding showed that physical and financial capital was very high and the rest were deemed high, this study found social assets to be the highest among grasscutter farmers. Also, Nxumalo and Antwi's (2013) findings on human capital showed an emphasis on empowerment in both formal and non-formal education. Livestock production supports asserts such as human (FAO, 2011), social (FAO, 2011), financial (FAO, 2011; Alvi et al., 2015; Weyori et al., 2018) and physical needs (FAO,2011) representing about 70.0% of many poor people globally by providing cash inflows for farming, education of children and medical needs of the family (FAO, 2011).

The result on livestock kept by farmers generally showed that though many farmers kept various livestock, the livestock numbers were few. However, it is worth noting that during the period of data collection, many of the farmers complained of high mortalities among their poultry, grasscutters and pigs due to infectious diseases. These mortalities could account for the few numbers of livestock owned by grasscutter farmers during the period the data was collected. The low numbers of pigs and ducks may also be due to religious reasons as Muslims do not eat these livestock. These

results are contrary to the findings of Opong-Anane (2008; GSS, 2012) who indicated that the majority of livestock and animal products are produced by smallholder farmers in northern Ghana. Among the livestock kept by the farmers, a majority (86.0%) reared goats supporting GLSS's (2008) finding that 60.0% of goat production in Ghana is from northern Ghana. A majority (88.5%) kept chicken which corroborates with a report by FAO (2014) indicating that almost all rural households in Ghana keep chicken. A majority (53.8%) kept guinea fowl which corroborates with the finding of FAO (2014) stating that guinea fowl is the next most economically viable and abundant bird after the chicken. A majority (59.6%) of the farmers also reared sheep.

The study also revealed that maize (90.0%), rice (56.0%), mango (60.0%), beans (67.0%), shea (54.0%), kenaf (69.0%), okro (79.0%), pepper (69.0%), tomatoes (71.0%), groundnuts (75.0%) were the crops mostly cultivated by the farmers. The result is similar to the findings by Bawa (2019) and Jager et al. (2022).

Both bivariate and multivariate analyses were performed to analyse farmers' risk attitude/risk-taking experience for five risk categories. The bivariate or unadjusted model showed that farmers have higher odds of taking risks in the grasscutter business for all the five categories but only marketing and production risks were statistically significant at a 5.0% level of significance. A confounding effect was observed when other covariates were added to the model. In the adjusted model, the major finding revealed that farmers still showed higher odds of association between marketing risk and risk attitude, production risks and financial risks but only production risk was significantly associated with farmers' risk-taking experience. Though the addition of other risk variables affected the significant correlation between marketing risk and the risk-taking experience of farmers, the odds of farmers accepting marketing risk in the grasscutter business were still higher than that of the odds of associating financial risk with farmers' risk-taking experience. This may be because farmers used their experience of marketing other livestock to minimise the marketing risks on their grasscutter business while also being economical in their spending on the business. For production risks, a unit increase in production risk will result in a 4.58 odds higher increase in the risk-taking experience of grasscutter farmers in the univariate model and a 10.48 odds higher increase in the multivariate model. This means that farmers were willing to take more risks in grasscutter production as compared to the other risk

categories. The reason could be that production risks have more consequences than the other types of risks because farmers depend on what they produce as food in the home and will be more willing to take risks to produce them. There have been studies on rural farmers' willingness to take more production risks than other risk categories. One example of such studies is the finding of Meuwissen et al. (2011) which showed that farmers were more willing to take risks in production than in marketing issues which is similar to the results of this study. The same study found that farmers took more financial risks than marketing risks which disagreed with the result of this study. The odds of farmers taking risks in human personnel and institutional-related cases decreased in the adjusted model.

The multivariate ordered logistic regression revealed that the predicted probability of a male grasscutter farmer or the probability that a male grasscutter farmer would succeed is 12.079 lower than being a female grasscutter farmer when it comes to risk-taking in the grasscutter business among farmers. In this case, female grasscutter farmers were more likely to take risks and succeed than male grasscutter farmers. This finding contradicts several studies such as Brick et al. (2012), Nielsen et al. (2013), Ye and Wang, (2013) and Hermann and Mußhoff (2017) for the same variables and their association with the risk attitude of livestock farmers.

Also, the findings of the study showed that older farmers were more willing to take risks than younger farmers. This is so because older farmers could have more experience in risk-taking than younger farmers. Also, older farmers have accumulated wealth over the years and could use the wealth to diversify their risks as compared to younger farmers. The result of this study supports the findings of Aye and Oji (2009) and van Winsen et al. (2016) who found that older farmers are more willing to take risks than younger farmers. The work of Flaten et al. (2005), Picazo-Tadeo and Wall (2011) and Ye and Wang (2013) did not find any significant relationship between age and risk attitude. However, the result for age in this study contradicts the findings by Deakin et al. (2003), Sherrick et al. (2004), Mischra and Godwin (2006) and Ullah et al. (2015) who found a negative relationship between age and risk attitude indicating that younger farmers are more adventurous and take risk more than older farmers.

The result of education from the study revealed an important factor in farmers' risk attitude. Farmers who had higher formal education had a positive and significant

association with risk attitude compared to farmers with less formal education. The reason could be that farmers with higher education are literate and can read widely about grasscutter production activities and will want to try rearing them more than farmers with little information on grasscutter production activities. Many previous studies posited that education plays an important role in risk attitude. The finding of this study on education and risk attitude also supports those previous studies. For instance, Meuwissen et al. (2001), Jing et al. (2001), Aye and Oji (2009), Mischra and Godwin (2006), Dadzie and Acquah (2012), Nielsen et al. (2013), Ullah et al. (2015) and Iqbal et al. (2016) postulated that people with higher education are less risks averse than those without or with less education though Ye and Wang (2013) reported and non-significant association between education and risk attitude.

The study revealed that farmers had a positive risk attitude when the household size was five to ten members. When the household size was more than ten, the risk attitude decreased. This finding is contrary to the work of Dadzie and Acquah (2012) who posited that a larger household size of farmers would assist in farm labour work and therefore significantly associated with farmers' risk attitude. Also, Hallahan et al. (2004) and Dohmen et al. (2011) revealed that people become more risk-averse when the number of dependents increases. However, the study of Picazo-Tadeo and Wall (2011) reported no significant result on household size and its association with risk attitude of farmers.

Grasscutter farmers had a lower probability of taking risks when the years of rearing were more than five. This may be due to the difficult nature of keeping grasscutters under captivity and farmers would probability want to keep them for a few years to minimise risks. Though Aye and Oji (2009), Ullah et al. (2015) and Iqbal et al. (2016) found a positive correlation between years of rearing experience and risk attitude, this finding contradicts their findings and supports the study of Flaten et al. (2005) who did not find any correlation between years of experience and risk attitude. Ye and Wang (2013) also reported mixed results across study groups between years of rearing experience and risk-taking experience of farmers.

The study further showed that grasscutter farmers had a low success probability of taking risks in grasscutter production when the farm size was more than five. This may be because farmers probably wanted to try the production on a small scale and minimise

risks associated with grasscutter production. Though this result is similar to the finding of Velandia et al. (2009), it, however, contradicts the works of Jing et al. (2001), Meuwissen et al. (2001), Xiao et al. (2001), Flaten et al. (2005), Lucas and Pabuayon (2011), Ullah et al. (2015), Iqbal et al. (2016) Bishu et al. (2016), Van Winsen et al. (2016) and Ngarava et al. (2018) who found that farmers with larger farm size are positively associated with risk attitude than farmers with smaller farm size.

The study also revealed that off-farm jobs played a significant role in grasscutter farmers' risk attitude. Grasscutter farmers expressed a higher positive attitude toward risk when they had other sources of income. In this case, off-farm income would reduce the dependency on the grasscutter farm income. This result agrees with the findings of Flaten et al. (2005) and Mischra and Godwin (2005). Consequentially, the finding of this study showed that higher income correlates with a positive risk attitude of farmers. When the general farm income was above GH¢20000.00, farmers showed a positive, significant and higher probability of taking risks as compared to farmers whose general farm income was below GH¢20000.00. This may be because farmers could venture into other businesses and share risks as the capital increases. This finding supports the works of Meuwissen et al. (2001), Mosley and Verschoor (2003), Lamb (2003), Flaten et al. (2005), Aye and Oji (2009), Dadzie and Acquah (2012) and Ye and Wang (2013) who found out that risk-averse decreases with increasing wealth.

Another major finding of this study is on the sales of grasscutters by farmers since they started the business. Farmers who sold grasscutters above GH¢500.00 showed a positive and significant risk attitude. Those who never sold grasscutter had an inverse relationship with risk attitude and therefore were risk averse. This means that higher earnings from grasscutter sales would result in farmers' positive attitude toward risks and hence would be more willing to take risks. This finding supports the works of Meuwissen et al. (2001), Flaten et al. (2005), Aye and Oji (2009) and Dadzie and Acquah (2012) who indicated in their studies that higher earnings from sales of farm produce correlate positively with farmers risks attitude.

The study revealed various concerns of grasscutter farmers. The result showed that majority of grasscutter farmers were very concerned on frequent or sudden death of grasscutters (45 farmers, 86.50%), premature death of grasscutters (42 farmers, 80.80%), aggression of grasscutters (34 farmers, 65.40%), little or no institutional or

government support for grasscutter production (34 farmers, 65.40%), feed shortage (33 farmers, 63.50%), little or no veterinary services (33 farmers, 63.50%), disease outbreak (33 farmers, 63.50%), lack of access to credit (31 farmers, 59.60%), little skill development (31 farmers, 59.60%), poor technical know how to handle grasscutters (30 farmers, 57.70%), lack of medication for grasscutters (29 farmers, 55.80%) and insufficient breeding stock (28 farmers, 53.80%). Though grasscutter domestication started five decades ago in Ghana, numerous challenges still exist in their production activities. They are delicate ruminants with fragile bones and jump at the slightest noise. Usually, they go through a lot of stress during visits by farmers, strangers and noise from other domestic animals. They are also still undergoing captive breeding and all these activities have an impact on their health. Because feeding is a challenge in the dry season, the nutrition of grasscutters is usually poor which could lead to premature stillbirth and maternal mortalities. Grasscutters are frightened when approached by strangers or stray animals like lizards, snakes and bats. They therefore turned to be aggressive in defense. Farmers reported sudden death of their grasscutters which can be attributed to the above scenarios. This finding supports the study by Adenyo et al. (2020). Though grasscutter is a recognized natural mini-livestock in Ghana, it has not received intensive government support compared to other livestock like goats, sheep, cattle and poultry. In the UWR, MoFA has been supporting grasscutter production by providing office space for GIFT to run the Ghana Grasscutter Project. This support is to coordinate the activities of farmers through monitoring activities. Some farmers also indicated limited visits by Agric extension officers at the various districts where the project operates. The result supports the finding by Tembchako and Mrema (2016) which showed that provision of extension services was significant and positively correlated with rabbit production. Grasscutters are adapted to eat only grass and crops produced. When these are lacking during the dry season, a major feed challenge occurs. The result on feed shortage agrees with the finding by Bishu et al. (2016) on cattle production as a major risk concern for farmers, especially in the dry season and also corroborates with studies by (Adu et al., 1999; Dery et al., 2020; Adenyo et al., 2020) on grasscutter feed management. The veterinary services to grasscutters as indicated by farmers are a major concern. Captive breeding in the region is very young and farmers struggled to offer the best medication to the grasscutters. Similar concern has been expressed by cattle farmers in the study of Bishu et al. (2016). Also, a lack of medication and few veterinary services (Akinyemi and Ijeomah, 2009) have been

reported among grasscutter farmers. As a result of the limited veterinary services, farmers had major concerns about disease outbreaks of their grasscutters. This finding corroborates a study on poultry farmers in Nigeria by Salman et al. (2014) who reported that disease outbreak was one of the major risks concerns in poultry production. The study revealed that access to credit was a major risk concern for farmers. Though farmers belong to cooperatives at the district and regional level, they had limited access to credit facilities to expand their production. This may be due to a lack of collateral to help secure the credit for repayment in the future. A similar finding has been reported in the study by Tembachako and Mrema (2016) on constraints on rabbit production which is also a mini-livestock like the grasscutter. The authors reported that lack of access to credit facilities to construct hutches was a major risk concern. Another major finding from the study is poor technical assistance. Though GifT officers monitor the production activities of farmers at the farm every month, farmers still expressed that poor technical support was a major risk concern. A similar result has been established by Adu et al. (1999) among grasscutter farmers. Access to breeding stock has been a challenge for interested farmers. All beneficiaries of GifT have been freely supplied with the breeding stock either by purchasing them in Accra or retrieving them from successful farmers. As the interest in production grows, many farmers queued for their turn to be supplied more of the stock for expansion and that has been a major concern. This result is similar to findings by Adu et al. (1999), Akinyemi and Ijeomah (2009) and World Bank (2011).

The finding showed that among the thirty risk concerns, the first three major risk concerns ranked were losses of grasscutters due to mortality with a mean of 3.90 (SD=0.63), high cost in rearing grasscutters with a mean of 3.83 (SD=0.96) and uncertainty in regular supply of grasscutters for expansion with a mean of 3.79 (SD=0.89) for ranks one, two and three respectively. As the result revealed, the first major risk ranked by farmers is losses of grasscutters due to mortality. The indication of the mortality could be attributed to sudden death, premature death and death from feed contamination especially in the rainy season as revealed by some farmers. The rainy season is accompanied by the accumulation of faecal coliforms on grasses and this could also result in diseases infections and the death of grasscutters. The losses of grasscutters due to mortality agree with the finding by Adenyo et al. (2020).

The second finding from the study on risk concerns ranked was the high cost of feeding the grasscutters. Grasscutters usually eat grass and do not compete with humans for food. However, farmers used crop produce to feed their grasscutters especially, in the dry season when feed is limited. This has a direct cost on production. Also, pelleted feed is expensive and many farmers are unable to afford it. This makes the general feeding of grasscutters expensive. The result therefore supports the finding by Akinyemi and Ijeomah (2009) who reported high costs in grasscutter production among grasscutter farmers. Thirdly, the study revealed that uncertainty in the regular supply of grasscutters was a major concern to farmers. Since grasscutters are bought and introduced to farmers by GIFT, farmers have no control of the supply. Usually, some farmers who lost all their grasscutters were resupplied with another set of breeding stock to continue production and in most cases, they would have to wait till the time that GIFT has been able to source funding to buy more grasscutters. This uncertainty is a major concern to farmers. The result is similar to the findings by Adu et al. (1999) and Akinyemi and Ijeomah (2009).

Out of the thirty-one risk management strategies presented to farmers to rank, sixteen of them were ranked from agree to strongly agree. Noticeably, most of the management strategies that were ranked centred on production risk management. The first to the sixteenth management strategies as ranked respectively were above the overall mean of 3.54 (SD=0.99). The first five ranked major management strategies are discussed below.

The management strategy used by farmers was to call on experts to check on their grasscutters when they fall sick. As little extension services are offered to farmers by the extension agents from MoFA, monitoring and supervision have been the main tasks of GIFT staff in the region. There is therefore frequent communication between the farmers and the field officers on the production of the grasscutters.

The second major finding of the management strategy is that farmers ensure that the feed given to grasscutters is clean. Clean feed is crucial in grasscutter production. The feed is cleaned to ensure that foreign materials such as insects, sand and other forms of dirt are taken off the feed to prevent feed contamination. Studies such as Dery et al. (2020), and Adenyo et al. (2020) emphasized the importance of presenting clean feed to grasscutters. The result of this study on clean feed fed to grasscutters as one of the

major management strategies for improved grasscutter production supports the study of Folitse et al. (2020).

The third major management strategy was that farmers engaged themselves in networking with other producers and attended workshops to learn more about grasscutter production. GIfT (2020; 2021) reported the formation of cooperatives and a business network platform among grasscutter producers in the Upper West region where useful information on grasscutter production is shared. Also, annual workshops are organized by GIfT for producers and researchers to discuss successes and challenges between the farmers and researchers so that the challenges can be addressed.

The fourth-ranked major management strategy was reporting illness and death of grasscutters to technical experts to handle. A lot of infectious diseases have been identified in grasscutters (Opara and Fagbemi, 2008; Futagbi et al. 2010; Aboagye et al., 2019). Farmers are not familiar with the treatment of these diseases, so they usually report illnesses to the GIfT monitoring team to administer appropriate drugs to the grasscutters. Some of the medicines given to the grasscutters include albendazole and bioactive such as the bark of moringa, mango and iroko trees. These bioactive prevent gastric infections. Among cattle farmers in Norway, Flatten et al. (2005) and Waweru (2017) reported the prevention of diseases as a perceived management strategy adopted by farmers.

Fifthly, farmers reported that they tried to identify problems in their farms and solved them by themselves. As farmers gathered experiences over the years through information sharing, networks and workshops, they got used to solving their production problems. This is important for the independence of farmers. GIfT (2018) emphasized the need for farmers to be independent and expand their farms without extensive monitoring services offered to them.

The major finding on the result of farmers' resilience showed that grasscutter farmers demonstrated moderately high resilience of about 86.0% out of the total possible outcome with self-reliance being the best performing dimension of about 36.0% of the total mean score. The percentage resilience score is greater than the result of Nuvey et al. (2020) who found a resilience level of 52.0%. Self-reliance, purpose and authenticity were statistically significant ($p \leq 0.05$). In the adjusted model, only purpose and authenticity remained statistically significant. Nuvey et al. (2020) found perseverance

to be the best resilience item among cattle farmers. This study however revealed through the bivariate and multivariate regression that the resilience characteristics 'purpose' had the highest odd ratio value in both models and was significant indicating the most important resilient variable on grasscutter risk resilience management strategies. This means that the odds of grasscutter farmers engineering resilience as part of their management strategies are higher when they believe in the purpose of their business. Wagnid and Young (1993) described purpose to mean the ability to comprehend the context of a situation in which the individual finds himself. An example of an item under purpose is 'My life has a meaning' has been found by Caligari et al. (2016) to have a positive correlation with the R-14 scale. The least resilient item in this study is equanimity of about 12% resiliency.

7.3 Consumers' Preferences and WTP for Grasscutter Meat

The major finding on the consumer preference and WTP for grasscutter meat revealed that 94.19% of the respondents were economically active while 5.81% were beyond the retirement age. The result therefore indicated that consumption of grasscutter meat cut across all the classified age groups. This finding corroborates with the result of Odebode et al. (2012) who posited that consumption of grasscutter meat spans across both young and older consumers. This age distribution is also similar to the result of GSS (2012) and a study on the assessment of the consumption trends for grasscutter meat in Ga West Municipality and the development of a thermal process schedule for canned minced grasscutter meat by Dery (2015). The result also showed that consumption of grasscutter meat is more prominent with the younger age. This finding supports the result of Adefalu et al (2012) who posited that younger consumers are still economically active, work and earn more and therefore have more purchasing power than those at retiring age. The result on age also supports the findings of Saha et al. (2022).

The gender of consumers revealed that male consumers were more willing to purchase grasscutter meat than their female counterparts. This finding is similar to a study by Mclean-Meyinsse (2003) on goat meat preference among goat meat consumers which found that male consumers prefer goat meat over their female counterparts using binomial logit and ordered probit models. Also, a similar study by Knight et al. (2006) who conducted a study on goat meat shopping preferences in the United States reported

that male goat meat consumers were more willing to shop and purchase goat meat than their female counterparts.

The study found that a majority (79.59%) were Christians. The result is supported by studies of Dery et al (2015) and Ghana's 2020 Population and Housing Census which reported that Christians form the majority religion in Ghana. The majority (86.72%) had basic education up to tertiary education. Since the majority of the respondents had higher formal education, it is suggestive that most of the respondents fall within the high-income group and therefore could afford grasscutter meat. This observation is supported by the result of Odebode et al. (2012) who found out that people with higher formal education tend to earn more and afford commodities than people with lower formal education.

Another major finding from the study is that the majority of the consumers (92.0%) said they would prefer grasscutter meat over other meat if it is available at eateries. However, about 86.0% of the respondents were WTP for grasscutter meat compared to other meat at eateries. This shows that preference and WTP decision for grasscutter meat is very high among grasscutter consumers. Studies have been conducted and revealed a high preference for grasscutter meat comparable to other meat. These studies include Odebode et al. (2011) and Adenyo et al. (2020). This study therefore supports the findings from these authors that a majority of grasscutter patrons are WTP and eat grasscutter meat compared to conventional livestock meat.

Out of the thirty-four (34) consumers who said they did not prefer grasscutter meat over other meat, a majority of them (about 71.0%) expressed fear of infections from consuming grasscutter meat. This could be due to the awareness creation of several emerging zoonotic infections especially the popular Ebola infections in Africa where the infections were partly attributed to wildlife including the grasscutter. For example, Opara and Fagbemi (2008) opined that the grasscutter is a great reservoir of many diseases such as trypanosomiasis, babesiosis, plasmodiasis, some zoonotic gastrointestinal helminths and protozoa. Also, Aboagye et al. (2019) identified seven protozoan species and eleven genera of helminths from wildlife species including the grasscutter.

The major finding on the bid levels showed that the highest WTP value was GH¢10.50 representing about 77.0%. Secondly, when the bid amount was increased to GH¢15.40

for the same quantity of grasscutter meat, only about 56% were willing to pay for grasscutter meat. The result reflects the prediction of economic theory which states that as the price of a commodity increases, the acceptance rate for the particular commodity will decrease and vice versa provided all things remain constant. This finding agrees with similar consumer demand behaviour as reported in the studies by Deely et al. (2022) and Saha et al. 2022).

The major finding on the factors influencing consumers' WTP for grasscutter meat over other meat revealed that the physical surroundings of the food service joint, location of the food service joint, availability of grasscutter meat in the food service joint, taste, softness or texture, loyalty to the food service, healthiness and nutrients quality of grasscutter were all statistically significant at the bivariate level. This means that consumers would have higher odds of WTP for grasscutter meat when these attributes increase by one unit each. The variable with the highest odds (93.04) was the nutrient quality of grasscutter meat. An increase in one unit for nutrient quality will therefore results in an increase of 93.04 folds for WTP for grasscutter meat. In the multivariate model, the effects of these variables were greatly affected. Only the softness or texture and nutrient quality of grasscutter meat remained statistically significant at a 5.0% level of significance.

The texture or softness of meat products informs consumers' purchase intentions. In this study, the texture of grasscutter meat impacted its WTP by consumers and this agrees with O'Quinn et al. (2018) who conducted a study on the evaluation of the contribution of tenderness, juiciness, and flavour to the overall consumer beef-eating experience and Felderhoff et al. (2020) who conducted a study on beef quality preferences and factors driving consumer satisfaction in the United States (US). Loyalty to the food service has played a significant role in consumer demand for food products. This finding confirms the result of the study by Soriano (2002). Similarly, Dissanayake et al. (2020) conducted a study on the impact of loyalty value on purchasing intention; a comparative analysis of healthy food and unhealthy food advertisements in Sri Lanka and revealed that loyalty plays a significant role in the purchase intentions of consumers in the food industry. The study also agrees with several studies (Owusu and Anifori, 2013; Yamoah and Adams, 2015; Gumber and Rana, 2017; Meeprom et al., 2023) who reported that consumers prefer to pay for safer food products because safer food tends to have more health benefits. Nouhoheflin et al. (2015) and Acheampong et al. (2017)

have also demonstrated that product attributes such as nutritional value increase consumers' WTP and preference for food products. Martin and Frumkin (2005) observed that consumers' reason for choosing a food service is because of the quality of the food being served. As reported by many studies such as Kivela et al. (2000), Raajpoot (2002) and Wailing and Larsson (2009), aspects of food quality include its nutritional quality, taste and texture. As a result, any food product that constitutes high quality tends to have a positive influence on the overall attitude and satisfaction of the individual. According to Martin and Frumkin (2005), Sharkey et al. (2007), Ferdous and Chowdhury (2010) and Ekanem et al. (2013), the location of the food service is an important marketing and business item that needs to be considered. Therefore, the location of the food service outlet should be convenient to foster a good relationship between the business and customer satisfaction (Ndubisi and Chan, 2005). These findings corroborate the earlier studies on attributes that were found statistically significant in this study.

The major finding on selected socio-economic determinants for WTP for grasscutter meat showed that male consumers were WTP for grasscutter at all the bid levels than their female counterparts. This may be because male consumers generally consume larger portions of food than females. This finding supports other studies in the literature. For instance, a study by Bower et al. (2003) on the assessment of how dietary habits and liking could affect purchasing traits showed that gender was a significant determinant of WTP purchase intent. In a CVM, Nandi et al. (2017) recently found gender to be significantly associated with WTP for organic food products. Dibb and Fitzpatrick (2014) also found out that men usually consume more than women and would therefore be more WTP for food products that they eat. Also, a study by Erasmus et al. (2014) asserted that women are more selective when making purchasing decisions but that men are more risk takers and WTP for products than women.

The result revealed that consumers with separated marital relationships were not WTP for bid 3 than their married counterparts. The reason could be that grasscutter meat is generally more expensive than other conventional meat and requires additional costs which married couples may contribute and purchase more than their counterparts. This result is similar to the findings of Amfo and Ali's (2020) study on consumer satisfaction and WTP for upgraded meat standards in Kumasi, Ghana. Additionally, the result also

corroborates with studies by Mohammed et al. (2014) and Nandi et al. (2017) who revealed that marital status influences consumers' WTP premium for products.

The result on household size showed that consumers with more members in a household were WTP for grasscutter meat but when the price was increased, WTP decreased. Therefore, any additional members of the household will decrease consumers' WTP for grasscutter meat. This may be because consumers may have to spend the money on many other family needs and therefore would want to save more money than buying grasscutter meat. This negative correlation occurs across all the bids. The result corroborates with the findings of Acquah (2011) and Quagrains (2006) on WTP for organic and inorganic food in Ghana. The result however differs from Radman et al. (2012) who posited that larger household size showed an important influence on WTP for products. Also, Mohammed et al. (2014) and Nandi et al. (2017) showed that household number significantly influences consumers' WTP for premium products.

The results revealed that higher educational levels of consumers increased WTP for grasscutter meat and also at premium prices. The reason may be that those who attained higher educational levels had better knowledge of the quality of grasscutter meat and hence were WTP for the meat. This finding supports the result of Deely et al. (2022).

Additionally, the result showed that older consumers were WTP for grasscutter meat and at a premium price than younger consumers. The reason may be that older farmers are more concerned about their health and therefore prefer meat of higher nutritional quality. This finding corroborates the study of Deely et al. (2022).

Results for preference for choice cuts of grasscutter meat showed that a majority (about 72.0%) of consumers preferred only the thighs of grasscutters. About 68.0% of consumers preferred frying as the method of cooking grasscutter meat while about 64.0% preferred dried grasscutter meat as a processing method.

The PCA results revealed two major components which include choice cuts (life grasscutter, head only and innards only) and processing and preservation method (canning and vacuum parking). These two components explained about 78.0% of the variations. The component's loadings explained the correlation between variables and common factors as stated by (Eze et al., 2021).

The result of the ordered probit model revealed that female consumers preferred vacuum-packed grasscutter as a preservation method than male consumers. Vacuum-packed products are not common in Ghana. However, this study agrees with a study by Erasmus et al. (2014) who revealed that women are more selective when making purchasing decisions than their male counterparts.

One of the major findings from the study was that there was a significant and positive association between the number of dependents and preference for life grasscutters in the ordered regression probit model. That is to say when the number of dependents for a consumer increases, preference for life grasscutter also increases. This may be due to reasons that many dependents would mean more meat consumption and so buying the life grasscutter can provide more meat for the dependents since they will utilize both meat innards and visceral organs. This finding differs from Acquah (2011) and Quagrains (2006) on consumers' preferences and WTP for organic and inorganic food in Ghana.

Another major finding from the study showed that consumers with higher levels of education preferred canned grasscutter meat than consumers with less educational status. The reason may be due to a lack of familiarisation of canned products especially for grasscutter meat for consumers who were not highly educated.

Again, a positive significant relationship occurs between household size and preference for canned grasscutter. This may be because consumers with larger household members may want to reserve the meat for family use. This result corroborates with the findings of Radman et al. (2012) who posited that larger household size shows an important influence on preference and WTP for products.

The ordered regression probit model for choice cuts and procession/preservation method for grasscutter meat also revealed that the monthly salary of consumers was found to be positive and significant suggesting that consumers with a monthly salary above GH¢2000.00 would prefer to buy vacuum-packed grasscutter meat compared with consumers with monthly salary less than GH¢2000.00. This may be because higher earnings could increase the purchasing power of consumers for grasscutter meat products. The result on monthly income supports the study conducted by Muzayyana and Dewi (2019) on determinants of household beef consumption in Indonesia.

7.4 Institutional Support for Grasscutter Farming in Upper West Region

The first major finding from the qualitative study in this thesis is that all grasscutter farmers who folded up received their breeding stock from GGP through GifT who was their main partner. They also collaborated with their family members and colleague farmers in taking care of the grasscutters. Also, GifT collaborates with MoFA through training of their livestock officers but the collaboration has been weak as farmers received little or no monitoring activities for their grasscutters from livestock officers. This weak collaboration could be a result of the fact that grasscutter is not prioritized in the government's flagship Rearing for Food and Jobs (RfFJ) programme. On the other hand, MoFA has a comprehensive agreement with agencies that support farmers with extension services such as veterinary services and technical training.

The result revealed that farmers and livestock officers had good knowledge of the kinds of crops cultivated in their districts or municipalities. The most common crops that are cultivated include cereal crops such as maize, millet and sorghum; leguminous crops such as groundnuts and beans; roots and tubers such as yam and cassava; fruits and vegetables such as tomatoes, okro, banana and pumpkin and economic tree crops such as shea and mango. These crops are largely the staple food for the people in the UWR and hence are cultivated in large quantities for both consumption and sale. This finding supports Bawa (2019) and Jager et al. (2022) who revealed similar results on main crops grown the UWR.

Also, responses from farmers, livestock officers and personal observation showed that fifteen different animals are reared in the various districts and municipalities where the interview was conducted. Some of the animals include ruminants such as goats, sheep and cattle; non-ruminants such as pigs, dogs and cats and poultry such as chicken, guinea fowl, turkey and ducks. Among all these animals, chickens, goats and sheep were the ones largely reared because of easy access to feed and good market prices. This result corroborates with the findings of the Ghana Living Standard Survey [(GLSS) (2008)] and FAO, (2014).

The finding showed that the major problems to livestock and poultry production mentioned by livestock farmers were non-availability of feed, especially during the dry season, disease infections of animals and poor housing system. During the rainy season, most animals depend solely on fresh forages available in the environment. These are

mostly burnt as a result of bushfires leading to feed scarcity in the dry season. This finding agrees with studies by Bishu et al. (2016), Adu et al. (1999), Dery et al. (2020) and Adenyo et al. (2020) where farmers mentioned feed shortage as a major concern in livestock production including the grasscutter. Also, these animals suffer from diseases as a result of a lack of veterinary care partly due to inadequate veterinary services. This finding supports results from several studies (Tim et al., 2002; Okwiri et al., 2002; Akinyemi and Ijeomah, 2009; Salman et al., 2014; Bishu et al., 2016).

Another major finding from the study showed that technical information was disseminated to grasscutter farmers solely by GiFT field officers through workshops, videos, phone calls, posters and on-site visits. There was no transfer of technical information from livestock officers to farmers specifically on grasscutters due to lack of involvement in the monitoring activities of grasscutters.

The fifth major finding from the qualitative study is that farmers and livestock officers perceived three categories of risks namely production, financial and human personnel risks. The production risks mentioned were diseases leading to high mortalities and feed constraints which is similar to the result of Adenyo et al. (2020). Examples of financial risk perceived were the high cost of the housing system and the high cost of feed which is similar to the findings of Akinyemi and Ijeomah (2009).

7.5 Results Linkages with the Conceptual Framework and Theories of the Study

To explore the risk attitude and management of grasscutter farmers, the study drew on conceptual ideas of farmers' attitudinal responses toward their risk-taking experiences, management strategies and their capacities to respond when risks occur. Van Raaij's model of Economic-psychological relationships was adapted for this study. The model produces valuable insights that can reveal the psychology behind every decision, giving you the power to take informed actions that drive satisfaction. The model investigated the relation between farm and farmer characteristics and risk perception and as a second step the influence of risk perception on the economic behaviour of farmers. The results in this study are compatible with the concept and the Rational Choice Theory as well as the Resilience Theory used in this study. In this study, the relationship between farm and farmer characteristics and risk attitude was investigated as well as the relationship between risk management strategies and grasscutter farmers' adaptive capacities

(resilience). This was to make sense of the way farmers' take risk, manage them and adapt to adversity. The Rational Choice Theory and the Resilience Theory were combined to appropriately understand these attitudinal responses of grasscutter farmers toward risks and their adaptive capacity behaviour. Rational Choice Theory is important to understand human behaviour across economic, social and individual context. It is a proven applicable theory in social science in providing clarity in a decision-making process (Ogu, 2013). Fundamentally, the theory focuses on individual goal orientation and how they attain such goals based on their preferences (Ainsworth, 2020). The theory strength lies in its versatility, predictivity and its ability to determine individual behaviour (Ogu, 2013).

As the name suggests, the theory allows people to choose from several options or courses of action presented to them based on the belief that the choice made will best serve the interest of the individual (Elster, 1989). Greene (2002) summarised the steps involved in making a decision under rational choice theory including the definition of the problem, identifying the decision criteria, weighing the criteria, generating valid alternatives, rating it alternative on each criterion and calculating the optimal decision. In this study the Rational Choice Theory was useful to explain the kinds of risk grasscutter farmers experience, their attitude toward these risks and how they manage the different types of risks they face. For instance, the results of this study have demonstrated that grasscutter farmers showed positive association between the five risk categories (marketing, production, finance, human personnel and institutional risks) and their risk attitude. Especially, there was a significant association between production risk, marketing risk and risk attitude of grasscutter farmers indicating that farmers were more willing to take these risks than the others. The socio-economic variables of grasscutter farmers revealed varied associations and significant levels toward the risk attitude of grasscutter farmers. Rutter (2013) posited that resilience is the quality that distinguishes a resilient person from others in a comparable situation when they attain a comparatively favourable result in the face of adversity. Conceptually, resilience is a process that results from mediating processes (Van Breda, 2018).

The resilient scale (R-14) or (R) has been previously used widely by several researchers (Wagnild, 2009; Nuvey et al., 2020) which directly measures five attributes of resilience on a 7-point Likert scale was modified and used to assess how grasscutter

farmers engineer resilience as part of risk management. These attributes are purpose (three items), equanimity (two items), self-reliance (five items), authenticity (two items) and perseverance (two items). The results of this study demonstrated moderately high resilience of about 86.0% out of the total possible outcome with self-reliance being the best-performing dimension of about 36.0% of the total mean score. The percentage resilience score is greater than the result of Nuvey et al. (2020) who found a resilience level of 52.0%. Self-reliance, purpose and authenticity were statistically significant ($p \leq 0.05$). Also, the results showed that the resilience characteristics ‘purpose’ had the highest odd ratio value in both models and was significant indicating the most important resilient variable on grasscutter risk management strategies. This means that the odds of grasscutter farmers engineering resilience as part of their management strategies are higher when they believe in the purpose of their business.

The results of consumer preferences and WTP for grasscutter meat also demonstrated compatibility with the concept and theory of consumer behaviour. The consumer behaviour theory is more suitable for CTV elicitation techniques. The theory of consumer behaviour is where a rational consumer aims at maximizing utility from any bundle of goods subject to a given budget constraint. When making a purchase, consumers often weigh the pros and cons of various product packages. It's common for compromises to be made to find the best fit. These trade-offs consumers make for any bundle of goods are always expressed in their WTP for those goods under a constraint (Vidogbéna et al., 2015).

The random utility and Lancaster demand theory provides the most comprehensive framework for understanding consumers’ preferences and choices for related or unrelated commodities. They also highlight the importance of understanding the specific attributes that drive consumer preferences. Random Utility Theory suggests that consumers make choices based on the utility (satisfaction) they expect to derive from different options. The “random” aspect acknowledges that there are unobserved factors influencing these choices, making the utility somewhat unpredictable. Lancaster’s Demand Theory proposed that it’s the characteristics of a commodity that provide utility, not the commodity itself. For example, when choosing between two meat products, a consumer might consider features like nutrient quality, tenderness, healthiness and taste. The overall utility is the sum of the benefits provided by these individual attributes.

This study leans on grasscutter meat as a healthier meat than the conventional counterparts as a composite commodity together with other several attributes to draw the random utility empirical model. In this regard, WTP for grasscutter meat (healthier meat) leans on the microeconomic theory of utility maximisation where the consumer's objective is to maximise his or her utility under a constraint (fixed budget). The results based on the theory demonstrated that majority of the consumers (92.0%) said they would prefer grasscutter meat over other meat if it is available at eateries. Also, about 86.0% of the respondents were WTP for grasscutter meat compared to other meat at eateries. However, the WTP for the meat decreases as the bid levels increase for the same quantity of grasscutter meat which supports the microeconomic theory. The results further demonstrated that consumers would have higher odds of WTP for grasscutter meat when these attributes (the physical surroundings of the food service joint, location of the food service joint, availability of grasscutter meat in the food service joint, taste, softness or texture, loyalty to the food service, healthiness and nutrients quality of grasscutter) increase by one unit each. Also, socio-economic characteristics of respondents revealed varied level of associations with consumers' preferences and WTP for grasscutter meat.

7.6 Chapter Summary

The major findings revealed that grasscutter farmers have significantly higher odds of risk-taking experience for marketing and production risks. Secondly, the first three major risk concerns ranked were losses of grasscutters due to mortality, high cost of rearing grasscutters and uncertainty in the regular supply of grasscutters for expansion. Another finding revealed that calling on experts to check the grasscutters when they fall sick, presentation of clean feed to grasscutters, engaging themselves in networking with other producers and attending workshops to learn more about grasscutter production were some major management strategies. The resilience characteristics possessed by farmers for risk management were self-reliance, purpose and authenticity. Though the WTP for grasscutter meat decreases with increasing bid levels, consumers on average were WTP more for grasscutter meat compared to other meat substitutes. Also, WTP for grasscutter meat over other meat was influenced by the physical surroundings of the food service joint, location of the food service joint, availability of grasscutter meat in the food service joint, taste, softness or texture, loyalty to the food

service, healthiness and nutrients quality of grasscutter meat. The Chapter concluded by linking the results with the concepts and theories used in this study.

CHAPTER EIGHT

SUMMARY, CONCLUSION AND RECOMMENDATIONS

8.1 Introduction

This final Chapter highlights the major findings on farmers' risk-taking attitudes, farmers' risk concerns and management strategies and resilience management in grasscutter production. It also revealed consumers' preferences and WTP for grasscutter meat and the institutional support for grasscutter production. The Chapter also presents the conclusions and recommendations for the study. Also, it outlines the contributions of the study and areas for further studies.

8.2 Summary of Major Findings

8.2.1 Major findings on farmers' risk-taking attitudes, concerns and management strategies

The results revealed that farmers showed higher odds of risk-taking concerning marketing (COR = 2.25; $p = 0.05$) and production risks (COR = 4.58; $p = 0.02$). The study results on the association between farmer variables and farmers' risk attitude showed that male farmers had lower odds (coefficient value = -12.079) of taking risks than their female counterparts. Also, all the age groupings associated positively with risk attitude but older farmers appeared to take more risks than younger farmers. Higher educational levels of farmers correlated positively and significantly with farmers' risk attitude indicating that farmers with higher educational levels are more willing to take risks. Additionally, farmers with dependents of more than ten members were more risk-averse compared with farmers with ten or fewer dependents. Furthermore, there was an inverse relationship between farmers' number of years of rearing experience and risk attitude. For the association between farm variables and risk attitude, larger farm size had an inverse relationship with risk attitude while off-farm jobs, higher income and farmers who sold grasscutters had significant and positive associations with risk attitude. The major concerns of grasscutter farmers include frequent or sudden death (86.50%), premature death of grasscutters (80.80%), the aggression of grasscutters (65.40%), little or no institutional or government support for grasscutter production (65.4%), feed shortage (63.50%), little or no veterinary services (63.50%), disease outbreak (63.50%), lack of access to credit (59.60%), little skill development (59.6%),

poor technical know how to handle grasscutters (57.70%), lack of medication for grasscutters (55.80%) and insufficient breeding stock (53.80%). Among these concerns, frequent or sudden death of grasscutters was the most challenging concern for grasscutters. The major management strategies used by grasscutter farmers include calling on experts to check on their grasscutters when they fell sick (M = 4.71; SD = 0.54), ensuring that they presented clean feed to the grasscutters (M = 4.69; SD = 0.51), they also networked with colleague farmers for technical advice (M = 4.67; SD = 0.62) and reported signs of illness and mortalities to GIfT officers for advice (M = 4.50; SD = 0.58). Lastly, farmers identified problems such as fight or cannibalism on the farm and tried to solve them by themselves by separating the animals (M = 4.46; SD = 0.54). Among these management strategies, the major management strategy used by grasscutter farmers was calling on experts to check on their grasscutters when they fell sick.

8.2.2 Major findings on grasscutter farmers' engineering resilience as part of risk management

The result on farmers' risk resilience showed that grasscutter farmers had moderately high-risk resilience score of about 86.0% in grasscutter production with a total score of 60.18 (SD = 8.62) out of a possible 70.0 based on the 5-point Likert ratings. Though self-reliance had the best performing dimensional score of about 36.0% of the total mean score, the resilience construct 'purpose' (p = 0.05), 'self-reliance' (p = 0.02) and 'authenticity' (p = 0.01) showed positive and significant relationships with farmers' risks management strategies.

8.2.3 Major findings on consumers' preference and WTP for grasscutter meat

The study revealed that the physical surroundings of the food service joint, location of the food service joint, availability of grasscutter meat in the food service joint, taste, softness or texture, loyalty to the food service, healthiness and nutrient quality of grasscutter were the factors that positively and significantly influenced consumers WTP for grasscutter meat over other meat. Among these, the most influential factor with the highest odds was the nutrient quality of grasscutter meat at both the univariate [COR = 93.04 (95% CI = 27.63–313.29), p = 0.01] and multivariate model [COR = 26.86 (95% CI = 3.36–214.50), p = 0.01]. The result also demonstrated that male consumers are WTP more for all three bids compared to their female counterparts. Also, marital status, household size, number of dependents, religion, educational level and occupation all

influence WTP and the different bid prices. Results for preference for choice cuts of grasscutter meat showed that a majority (about 72.0%) of consumers preferred only the thighs of grasscutters. About 68.0% of consumers preferred frying as the method of cooking grasscutter meat while about 64.0% preferred dried grasscutter meat as a processing method. The results from the PCA analysis revealed two major components. The probit analysis showed that female consumers associated positively and significantly (coefficient value = 0.852; $p \leq 0.05$) with vacuum-packed grasscutter meat than their male counterparts. Consumers with large dependents preferred live grasscutter while consumers with higher education associated positively with canned grasscutter meat over those without higher education.

8.2.4 Major findings on institutional support for grasscutter production

The result revealed that unsuccessful grasscutter farmers and livestock officers were well-versed in the kinds of crops cultivated and the different kinds of animals being reared. The major problems to livestock and poultry production mentioned by unsuccessful grasscutter farmers and livestock officers were non-availability of feed especially, during the dry season, disease infections of animals and poor housing system. The majority of unsuccessful grasscutter farmers perceived three categories of risks: production, financial and human personnel risks.

8.3 Conclusions

Farmers' risk-taking experiences were contained in five risk categories namely production, marketing, financial, human personnel and institutional risks. Among all of these, farmers had positive and significant risk-taking attitudes concerning production and marketing risks. Both farmer and farm variables influenced grasscutter farmers' risk attitudes either positively or negatively. Farmer and farm variables that were significantly associated with the risk attitude of farmers include gender, age, marital status, education, farm size, off-farm job and sales of grasscutters. The study results showed that farmers major risk concerns were losses of grasscutters due to mortality, high cost in rearing grasscutters, uncertainty in regular supply of grasscutters for expansion, consumer demand for its meat and availability of feed and inability to adapt to new technology on grasscutter rearing. Farmers used a lot of management strategies to care for their grasscutters. Some of the major farmers' management strategies included calling on experts, presenting clean feed, attending workshops and cooperative

meetings, reporting threats and diseases to experts and identifying problems and solving them.

From the study results, the resilience characteristics 'purpose' was the most important resilient variable on how farmers engineered resilience as part of grasscutter management.

The physical surroundings, location of food service joint, availability of grasscutter meat, taste, softness, loyalty to the food service joint, healthiness and nutrient quality of grasscutter meat have significant relationships with consumer preferences and are deemed the most important factors influencing consumers' WTP for the grasscutter meat. Also, variables such as gender, ethnicity, education, religion, number of dependents, occupation and household size were significantly associated with WTP for grasscutter meat. The thigh of grasscutter, frying and drying are preferred choice cuts, cooking and preservation methods by consumers. The study results also indicated that gender, number of dependents and educational level were significantly associated with choice cuts and processing or preservation methods for grasscutter meat.

The results from the qualitative study show weak institutional and policy support for grasscutter production. It revealed little collaboration between GIFT and MoFA livestock officers to extend extension services to the grasscutters compared to other livestock. This may be a result of a lack of prioritization of grasscutter production in the government's flagship programme for livestock production.

8.4 Recommendations

8.4.1 Recommendations on farmers' risk-taking experience, concerns and management strategies

- Farmers revealed a significant risk-taking experience toward marketing and production risks. This is important for their livelihood generation of income in the grasscutter supply chain business. Therefore, there should be a big push for both NGOs and the government for grasscutter production and meat commercialization. The results showed the influence of farmer and farmer variables on the risk attitude of grasscutter farmers. Significant socio-economic factors should therefore be taken into consideration when choosing beneficiaries for grasscutter production. Also, future researchers should focus

on these variables in more depth. Frequent on-site monitoring by GIFT should be carried out to interact more with farmers on the various concerns so that rapid procedural actions can be taken by management to address them. Also, MoFA and GIFT management should have a plenary discussion and develop a working document together with livestock officers to address the concerns raised by grasscutter farmers. There should be a comprehensive quality assurance policy for grasscutter production so that GIFT field officers and livestock officers of MoFA would use to train and encourage farmers to adopt the best management practices in their farms.

8.4.2 Recommendations on grasscutter farmers' engineering resilience as part of risk management

- Farmers should be encouraged to understand the various risks involved in grasscutter production and be trained to deal with adversities when they occur.

8.4.3 Recommendations on factors influencing preference for grasscutter meat and WTP for grasscutter meat

- Food service establishments should take into consideration, both intrinsic and extrinsic consumer factors for product demand. Food service establishments should take into consideration, the varied socio-economic characteristics and demand for grasscutter meat for inclusion into their meal planning. Producers, marketers and food vendors should take into consideration the different consumer preferences for meat attributes as well as demand for processed and packaged meat products in their business plans.

8.4.4 Recommendations on causes for unsuccessful grasscutter production, institutional support and policies for grasscutter production

- The GoG through MoFA and policy makers should partner with NGOs who support farmers to rear grasscutters and develop a robust grasscutter production plan into the Rearing for Food and Jobs and Youth Entrepreneur Programmes to expand the grasscutter business in Ghana.

8.5 Contributions of the Study

The study at first hand contributes further knowledge on grasscutter farmers' risk-taking attitude, concerns and risk management that would allow grasscutter farmers to understand critical risks in grasscutter production, identify the most crucial risks in

grasscutter farming and take appropriate steps to reduce negative impacts and failures and consequently attain sustainable food production, natural resource management, reduction in wildlife consumption and improvement in livestock production. The study also provides important information on consumer WTP price premiums for grasscutter meat products. It provides informative data to guide grasscutter producers and processors, food service owners, investors, consultants and researchers with marketing information on grasscutter meat. Furthermore, the study contributes knowledge to help address SDGs 1: No poverty, SDG 2: Zero hunger, and SDG 3: Good health and well-being.

8.6 Areas for Further Studies

A future study could expand the number of regions and sample size to provide a further understanding of grasscutter farmers' risk attitude and management. This study focused on grasscutter farmers supervised by the Ghana Grasscutter Project in the Upper West Region and consumers' WTP for grasscutter meat in the Wa Municipality so the results remain a reflection of grasscutter farmers and patrons of grasscutter meat in the study region alone. The focus was not to provide generalization but to understand the risk-taking experience, risk concerns, risk management and risk resilience of grasscutter farmers in the region as well as to understand the factors driving consumers' WTP for grasscutter meat.

The study shows that production and marketing risks significantly influenced grasscutter farmers' risk attitudes. The results can be linked to the use of risk management tools in future research.

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APPENDICES

Appendix 1.1: Risks Attitude and Management of Grasscutter Farmers in Ghana

The researchers kindly request that you complete this questionnaire regarding your risk attitude and management strategies concerning your grasscutters. The data provided will be held confidential by the researchers. Your responses will be used for academic purposes only. This survey will take you about twenty minutes to answer.

Sincerely,

Titus S.S. Dery

0207452002 / 0246856786

SECTION A: DEMOGRAPHICS OF RESPONDENTS

1. Gender 1=Male 2=Female
2. Age 1=20-29 2=30-39 3=40-49 4=50-59
 5=60+
3. Community of respondents.....
4. District of respondents. Tick the one that applies to you.

1	2	3	4	5	6	7	8	9
Wa Municipal	Wa East	Nandom	Wa West	Lambussie	DBI	Sissala East	Jirapa	Lawra

5. Marital status 1=never married 2=married 3=separated
 4=divorced 5=widowed
6. Level of education 1=no basic education 2=basic
 3=secondary school 4=tertiary
7. Primary occupation.....
8. Household size. Tick the one that applies to you.

1	2	3	4	5
1-5	6-10	11-15	16-20	21+

9. Number of dependents.

1	2	3	4	5
1-5	6-10	11-15	16-20	21+

SECTION B: FARMER AND FARM CHARACTERISTICS (OBJECTIVE ONE)

1. Years of rearing grasscutters.

1	2	3	4	5	6
<1	1-5	6-10	11-15	16-20	21+

2. Type of labour for grasscutter production. Rate the type of labour with 1=low and 5=high

Type of labour	Ratings (1=very dissatisfied 2=dissatisfied 3=no opinion 4=satisfied 5=very satisfied)					
	1	2	3	4	5	None
Family						
Hired						
Self only						

3. Level of labour contribution. Rate the level of contribution with 1=low and 5=high

Level of labour contribution	Ratings (1=very dissatisfied 2=dissatisfied 3=no opinion 4=satisfied 5=very satisfied)					
	1	2	3	4	5	None
Family						
Hired						
Self only						

4. Grasscutter farm size.

1	2	3	4	5
1-5	6-10	11-15	16-20	21+

5. Off-farm job? Choose all that apply to you.

	Off-farm job	Tick
Code		
1	No off-farm job	
2	Petty trading	
3	Causal labor	
4	Honey collection	
5	Traditional dancing	
6	Transportation business	
7	Agro-processing	
8	Extension services	
9	Manufacturing	
10	Other (please specify)	

6. Task or activity performed on your grasscutter farm? 1=low and 5=high

Task	Ratings (1=very dissatisfied 2=dissatisfied 3=no opinion 4=satisfied 5=very satisfied)				
	1	2	3	4	5
Manager					
Successor					
Partnership					

7. What is the nature of the building where the grasscutters are kept? 1=zinc roof house 2=thatched roof house 3=mud roof house

8. By experience as a grasscutter farmer what is the current stature of the building where your grasscutters are kept. 1=very good 2=good 3=pretty good not good 5=not very good

9. Next of kin for your grasscutter business? 1=wife 2=brother 3=sister
4=children 5=friend 6=none
10. What is your main source of finance for your grasscutter farm activities?
1=own capital 2=bank loans 3=NGO support
4=credit from farmer cooperatives 5=friends/relatives
11. Estimated total income from general farm (crops and animals) per year in Ghana cedis (GHS). 1=<20000 2=20000-40000 3=40000+
12. Estimated total off-farm income per year in Ghana cedis (GHS). 1=<20000
2=20000-40000 3=40000+ 4=none
13. Main accessible credit facilities. 1=bank loans 2=susu loans
3=Community Based Organization loans 4=friends and relatives
5=self-financing
14. Veterinary services of grasscutters. Rate the veterinary services with 1=very dissatisfied to 5=very satisfied

Current stature	Ratings (1=very dissatisfied 2=dissatisfied 3=no opinion 4=satisfied 5=very satisfied)				
	1	2	3	4	5
Treatment of diseases					
Preventing diseases outbreak					
Provision of drugs					
Protection of human life					

15. Agricultural insurance. 1=None 2=crop insurance
3=livestock insurance 4=Both crop and livestock insurance
16. Total sales made from grasscutters in Ghana cedis (GHS). 1=<500 2=500-1000 3=more than 1000 4=none
17. Indicate the type of livestock and crop in number and acreages respectively owned by your household by ticking the one that applies in the table below.

Livestock owned		1-5	6-10	11-15	16-20	21+	None
Dogs							
Goats							
Sheep							
Donkeys							
Doves							
Chickens							
Guinea fowls							
Pigs							
Ducks							
Grasscutters							
Rabbits							
Turkeys							
Cats							
Guinea pigs							
Cattle							
Crops owned	<1						
Maize							
Millet							
Sorghum							
Cocoa							
Cashew							
Rice							
Mango							
Beans							
Cassava							
Cocoyam							
Shea							

Dawadawa							
Baobab							
Kenaf							
Okra							
pepper							
Tomatoes							
Garden eggs							
groundnuts							
Bambara beans							
Tamarind							
Tiger nuts							

SECTION C: RISK ATTITUDE OF GRASSCUTTER FARMERS (OBJECTIVE TWO)

GRASSCUTTER REARING (LATENT CONSTRUCT, DEPENDENT VARIABLE)

1. Please complete the table using the five-points Likert Scale indicated.

As a grasscutter farmer, I am willing to take more risks concerning my grasscutter business with respect to:

<i>1=strongly disagree 2=disagree 3=neutral 4=agree 5=strongly agree</i>	1	2	3	4	5
1. Production issues					
2. Financial issues					
3. Marketing issues					
4. Human personnel issues					
5. Institutional issues					
What is your overall attitude toward the risks listed above					

17. Poor breeds						
18. Insufficient breed stock						
19. Low birth weight						
20. Lack of breeding equipment like troughs and cages						
21. Frequent and sudden death of grasscutters						
22. Diseases outbreak						
23. Size of grasscuttter too small						
24. Aggression of grasscutters						
25. Theft of grasscutters						
26. Snake attacks from search for feed						
27. Lack of medication for grasscutters						
28. Poor technical know how to handle grasscutters						
29. Little or no institutional support (government)						
30. Injury and accident						

**SECTION E: RISKS MANAGEMENT RESPONSE STATEMENTS
(OBJECTIVE FOUR)**

To what extent do you agree and apply these management strategies in your grasscutter business to minimize risks or lessen any negative impact

<i>1=strongly disagree 2=disagree 3=neutral 4=agree 5=strongly agree</i>	Risk group	1	2	3	4	5	Not relevant
1. I have off-farm income to support my business	FR						
2. I rely heavily on market information (for example government reports, private market news services) in making my marketing decisions.	MR						
3. I have sufficient labor to carry on production in case of my absence	PHR						
4. I ensure good location of my grasscutters	PR						

5. I diversify risk by rearing other livestock and crops	PR						
6. I insure my grasscutter business against losses	MR						
7. I engage in forward pricing of my grasscutters	MR						
8. I engage in market contracts to sell my grasscutters	MR						
9. I track market price information on grasscutter to manage price risk	MR						
10. I have liquidity against losses of my grasscutters	FR						
11. I belong to a producer group to assist me in the business	IR						
12. I belong to cooperatives to enable me access credit at lower cost	IR						
13. I call on experts to check my animals when they fall sick	IR						
14. I pay for the services of people to take care of the animals when I am traveling	FR						
15. I have good contacts with colleague farmers to discuss farm related issues	PR						
16. I report any threat such as death and diseases for technical experts to advise	PR						
17. I focus on both the threats and opportunities of my farm business	PR						
18. I try as much as possible to identify problems like fighting and cannibalism in my farm and solve them by separating them	PR						
19. I build trust with buyers with consensus on fixed price of grasscutters	MR						
20. I pay attention to environmental issues on my grasscutter production	IR						

21. I have quality assurance program for my grasscutter business	MR							
22. I have documented records for my grasscutter business	PR							
23. I supervise my grasscutters myself	PHR							
24. I ensure that the feed I give to my grasscutters is clean	PR							
25. I am willing to learn from friends and workshop to improve my grasscutter business	PHR							
26. I do not have much space to store feed for my grasscutters	PR							
27. My grasscutters have enough beddings to hide from strangers	PR							
28. I grow forages all seasons to provide enough feed for grasscutter	PR							
29. Variability of weather conditions do not affect my grasscutter business	PR							
30. I have secured housing system to avoid theft of my grasscutters	PR							
31. I utilize veterinary services to keep my grasscutters health								
		Financial risk (FR), Marketing risk (MR), Personnel or human resource risk (PHR), Production risk (PR). Institutional risk (IR)						

SECTION F: ENGINEERING RESILIENCE AS PART OF GRASSCUTTER MANAGEMENT (OBJECTIVE FIVE)

Use the resilience Likert scale (RS-14) and resilience characteristics to measure how you engineer resilience (your level of adaptive capacity in managing your grasscutters).

	<i>1=strongly disagree 2 = disagree 3=neutral 4=agree 5=strongly agree</i>	1	2	3	4	5
Resilience characteristics	Resilience scale measuring items					
Self-reliance	1. I usually manage my way or another					
	2. I feel that I can handle many things at a time					
	3. I can get through difficult times because I have experienced difficult time before					
	4. In an emergency, I am someone people can generally rely on					
	5. When I am in a difficult situation, I can usually find my way out of it					
Purpose	6. I feel proud that I have accomplished things in my life					
	7. I keep interested in things					
	8. My life has meaning					
Equanimity	9. I usually take things in stride					
	10. I can usually find something to laugh about					
Perseverance	11. I am determined					
	12. Self-discipline is important					
Authenticity	13. I am friends with myself					
	14. My beliefs in myself get me through hard times					

Thank you for your time

Appendix 1.2: Consumer Preference and Willingness To Pay for Grasscutter Meat in Ghana: A Contingent Valuation Techniques in Wa Municipality.

SECTION A: DEMOGRAPHICS OF RESPONDENTS

SECTION A: DEMOGRAPHICS OF RESPONDENTS

1. Gender 1=Male 2=Female
2. Age 1=20-29 2=30-39 3=40-49 4=50-59
 5=60+
3. Religion 1=Christian 2=Muslim 3=traditional 4=othe
4. Marital status 3=never married 2=married 4=separated
 1=divorced 5=widowed
5. Home region.....
 1=ashanti 2=central 3=Greater Accra 4=savana 5=upper
 east 6=upper west 7=volta
6. Ethnicity.....
7. Level of education 1=no basic education 2=basic
 3=secondary school 4=tertiary
8. Primary occupation.....
9. Household size. Tick the one that applies to you.

1	2	3	4	5
1-5	6-10	11-15	16-20	21+

10. Number of dependents.

1	2	3	4	5
1-5	6-10	11-15	16-20	21+

11. Monthly income 1=<GHS2000 2=GHS2000-4000
 3=aboveGHS4000

12. Do you prefer grasscutter meat over other meat if it is available as a choice?
 1=yes 2=no

SECTION B: CONSUMER WILLINGNESS TO PAY (WTP) FOR GRASSCUTTER MEAT AT EATERIES

13. If yes in question 12 above, will you be willing to pay more for grasscutter meat than other bushmeat if it is made available in chop bars and restaurants? 1=yes 2=no
14. If NO to question 13, state your reasons.....

If your answer in question 13 is YES, proceed with the following: The average bushmeat current market price of 0.15 Kg (150 g) is GHC7.00. Will you be willing to pay more for grasscutter meat than the stated price above if it is made available in chop bars and restaurants? [Before answering this question, please take into consideration that your budget is constraint. If you are willing to pay higher prices for grasscutter meat, you may have to reduce the expenditures for your other needs.]

[Note to the interviewer: The average current market price of bushmeat above serve as a start-up price for the WTP elicitation. Increase the current market price by 50% price premium (bid A) and manually write the amount in the blank spaces provided in the table below. If the respondent answers “yes” to the first bid, the second bid is set higher by assigning a price premium of 120% (bid A higher) on the initial price premium. If the respondent answers “no” to the first bid, the second bid is set lower by assigning respondents a discount 20% on the initial price premium.

Question	Amount
15. If yes in question 13 will you be willing to pay price increase of 50%?	GHS..... 1=yes 2=no
16. If yes in question 2, will you be willing to pay price increase of 120% on bid A?	GHS..... 1=yes 2=no
17. If no to question 2, will you be willing to pay for price reduction of 20% of bid A?	GHS..... 1=yes 2=no
18. On the average, how much will you be willing to buy a cooked piece of grasscutter meat comparable to a cooked piece of conventional livestock sources?	GHS.....

Please indicate YES or NO, whether each of the following factors influence your willingness to pay for grasscutter meat

Determining factor for WTP	Yes	No
19. Physical surrounding should be neat		
20. Service quality should be optimum		
21. Geographical location should be easily accessible		
22. Price should be moderate		
23. Grasscutter meat should be readily available		
24. Taste of grasscutter meat is better than other meat		
25. Appearance of grasscutter meat is nicer than other meat		
26. Texture of grasscutter meat is soft		
27. Aroma of grasscutter meat is better than other meat		
28. Personal loyalty to the foodservice outlet will motivate me to buy		
29. Foodservice brand name will motivate me to buy		
30. Grasscutter meat is healthier than other meat		
31. Grasscutter meat has higher nutrients		

SECTION C: CONSUMER PREFERENCES FOR GRASSCUTTER MEAT COOKING METHOD AND VALUE ADDITION

**Preferred portion of grasscutter meat to buy? Rate with 1=low preference
2=medium preference and 3=high preference**

Preference	1	2	3
32. Whole carcass			
33. Life grasscutter			
34. Only head			
35. Only thighs			
36. The innards			

Preferred cooking method for grasscutter meat. 1= low 2=medium and 3 = high

Preference	1	2	3
37. Boiling			
38. Frying			
39. Roasting			
40. Grilling			

Preferred processed or value added grasscutter meat. 1= low 2=medium and 3 = high

Preference	1	2	3
41. Smoked			
42. Dried			
43. Fermented			
44. Canned			
45. Vacuum packed			

Thank you very much for your time!

Appendix 1.3: Key Informant Interview Guide for MoFA Officials

Dear Sir/Madam,

My name is Titus S. S. Dery, a PhD candidate of SDD-UBIDS working on the above thesis topic. I kindly request that you complete this interview guide as a key informant regarding institutional support or policies, agricultural activities, problems confronting livestock production information dissemination and perceived risks in livestock farming including grasscutter production. The data provided will be held confidential and used for academic purpose only.

This survey will take you about twenty minutes to answer.

Sincerely,

Titus S.S. Dery

0207452002 / 0246856786

SECTION A: DEMOGRAPHIC CHARACTERISTICS

District....., Gender....., Age....., Designation.....

SECTION B: INSTITUTIONAL SUPPORT AND POLICIES FOR LIVESTOCK PRODUCTION

1. What role does your institution play in the development of the livestock industry? Probe: Tell me the division that is in charge of livestock production and what its functions are.
2. Do you partner with organizations or individuals within the Municipality or District in carrying out livestock production activities? Probe: If yes, which organizations or individuals? What have you done with each?
3. How long have you been working in the livestock sector in this District?
4. What sort of support do you give to livestock farmers in this District? Probe: How is the support given? Does the support cover both men and women? What is the agreement with beneficiaries for the support?
5. How does your institution map out the needs of livestock farmers?
6. Is there any government policy that specifically addresses grasscutter rearing? Probe: If yes, please mention the policy.
7. What are the successes for Rearing for Food and Jobs (RFJ) in this District?

8. How can grasscutter farmers benefit from these successes?
9. What are the major challenges of RFJ in this District?
10. What lessons can grasscutter farmers learn from these challenges of the RFJ policy implementation in this District?

SECTION C: KNOWLEDGE ON AGRICULTURAL ACTIVITIES

1. What forms of agricultural activities are practiced in your Municipality or District? Probe: What kinds of crops are largely cultivated by the people? What kinds of livestock are largely kept? Tell me about the specific varieties of the crops cultivated in the District. What kinds of livestock are reared?
2. Which animal is more prolific to rear in your District? Probe: Why do they do well?

SECTION D: PROBLEMS CONFRONTING LIVESTOCK PRODUCTION

1. What are the major challenges to livestock production in the District? Probe: Are there measures to solve them? If yes, what are these measures?

SECTION E: KNOWLEDGE ON GRASSCUTTER PROJECT IN THE DISTRICT

1. Do you know about the grasscutter project in your District? Probe: How do you know?
2. Does your institution support the grasscutter project in your District? Probe: How do you support the project? What specific support does your institution give to grasscutter farmers?
3. Do you think grasscutter production is beneficial to the farmers? Probe: If yes, how does it benefit the farmers and this District at large?

SECTION F: GRASSCUTTER PRODUCTION INFORMATION DESSIMINATION

1. What sort of grasscutter production information do you give to farmers? Probe: What specific grasscutter production information? What specific farming practices information?

2. Can you tell me how each of the above-mentioned information in Q1 is communicated to farmers? Probe: Who disseminates the information? How is the dissemination done?
3. What major problems hinder your institution in an attempt to disseminate grasscutter production information to farmers? Probe: What have you done to solve the problems?
4. How are grasscutter farmers responding to the above information disseminated to them? Probe: Which information do they value and which ones do they not value? Any evidence about change of behavior based on the information disseminated?

SECTION F: PERCEIVED RISKS IN GRASSCUTTER FARMING

1. Have you ever perceived risks concerning grasscutter farming in this District?
Probe: Tell me the risks. Which ones are major risks to you?
2. What can you suggest to grasscutter farmers to minimize the risks?

Any further comments?.....

Appendix 1.4: Key Informant Interview Guide for Unsuccessful Grasscutter Producers

Dear Sir/Madam

My name is Titus S. S. Dery, a Ph.D candidate of SDD-UBIDS working on the above thesis topic. I kindly request that you complete this questionnaire as a key informant regarding your sources of grasscutter breeding stock, agricultural activities, problems confronting livestock production information dissemination and perceived risks in livestock farming including grasscutter production. The data provided will be held confidential and used for academic purpose only.

This survey will take you about twenty minutes to answer.

Sincerely,

Titus S.S. Dery

0207452002 / 0246856786

SECTION A: DEMOGRAPHIC CHARACTERISTICS

District....., Date....., Gender....., Age.....,
Designation.....

SECTION B: GENERAL INFORMATION

1. Where did you get your grasscutter breeding stock? Probe: Tell me the agreement you had with the supplier
2. Did you partner with some organizations, colleagues or family within this Municipality or District in producing grasscutters? Probe: if yes, which organizations or individuals? What did you do with each? What sort of support did you receive from the organization or individuals in this District? What roles did they perform?
3. How long have you reared grasscutters in this District?

SECTION C: KNOWLEDGE ON AGRICULTURAL PRODUCTION

1. What forms of agricultural activities are practiced in your Municipality or District?

Probe: What kinds of crops are largely cultivated? What kinds of livestock are largely kept?

Tell me about the specific varieties of the crops cultivated in the District. What types of animals are reared?

2. Which animal is more prolific for breeding in your District?

Probe: Why do they do well?

SECTION D: PROBLEMS CONFRONTING GRASSCUTTER AND OTHER LIVESTOCK PRODUCTION

1. What are the major challenges to livestock production in the District?

2. What are the major challenges to grasscutter production in the District?

4. Why did you failed in the grasscutter business?

3. Do you think grasscutter production is beneficial in the District?

Probe: If yes, what are the manifestations of grasscutter production in the district?

SECTION E: GRASSCUTTER PRODUCTION INFORMATION DISSEMINATION

1. What sort of grasscutter information did you receive from suppliers or organizations?

Probe: What specific grasscutter production information?

2. Can you tell me how each of the above-mentioned information in Q1 was communicated to you?

Probe: Who disseminated the information? How was the dissemination done?

3. What major problems hindered you in attempt to translate the information into practice?

Probe: What are the limits and barriers to grasscutter information dissemination?

4. How did you respond to the above information disseminated to you? Probe: What is valued and what is not valued? Any evidence about change of behaviour based on the information disseminated?

SECTION F: PERCEIVED RISKS IN GRASSCUTTER FARMING

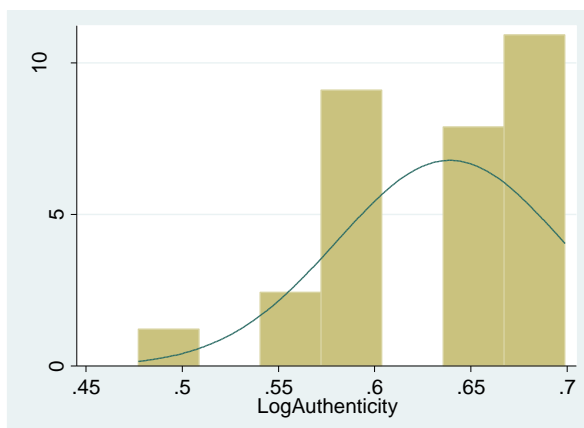
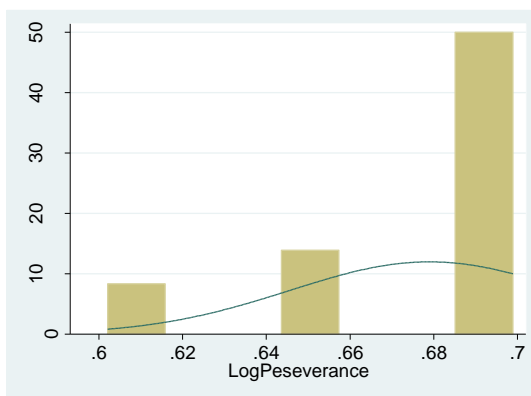
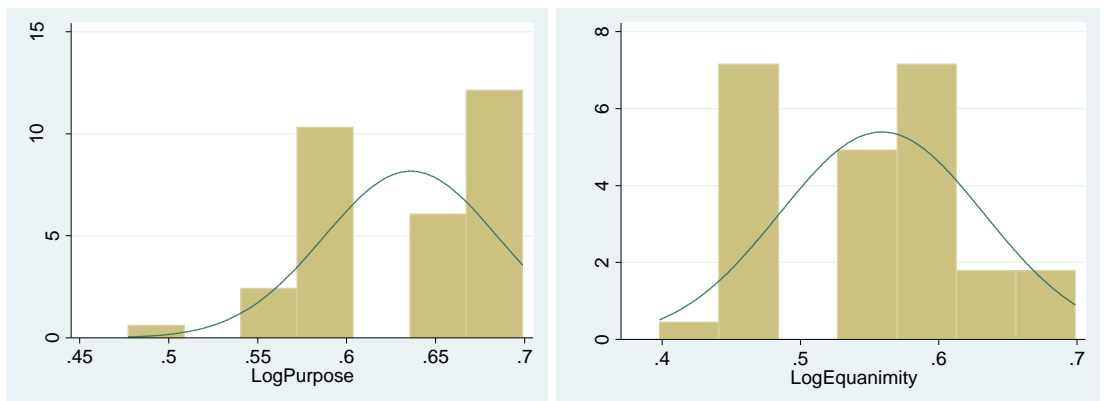
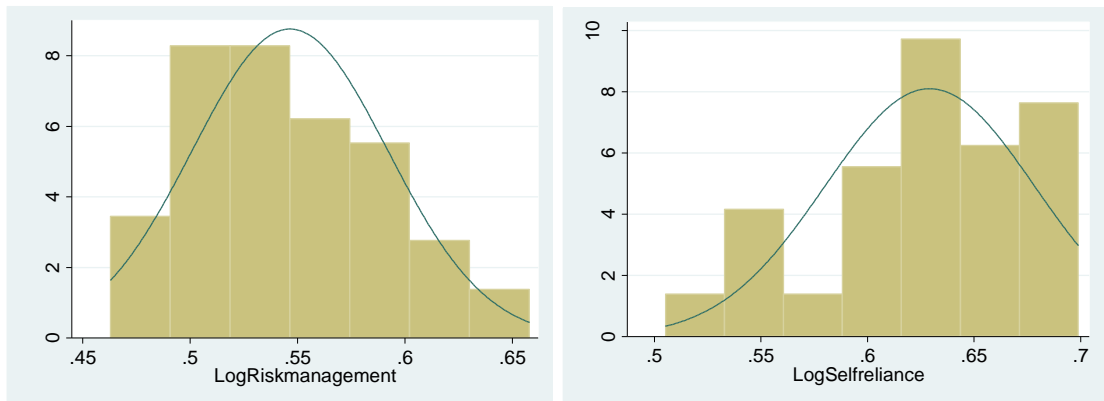
1. Have you ever perceived risks concerning grasscutter farming in the District?

Probe: Tell me the risks. Which ones were major risks to you?

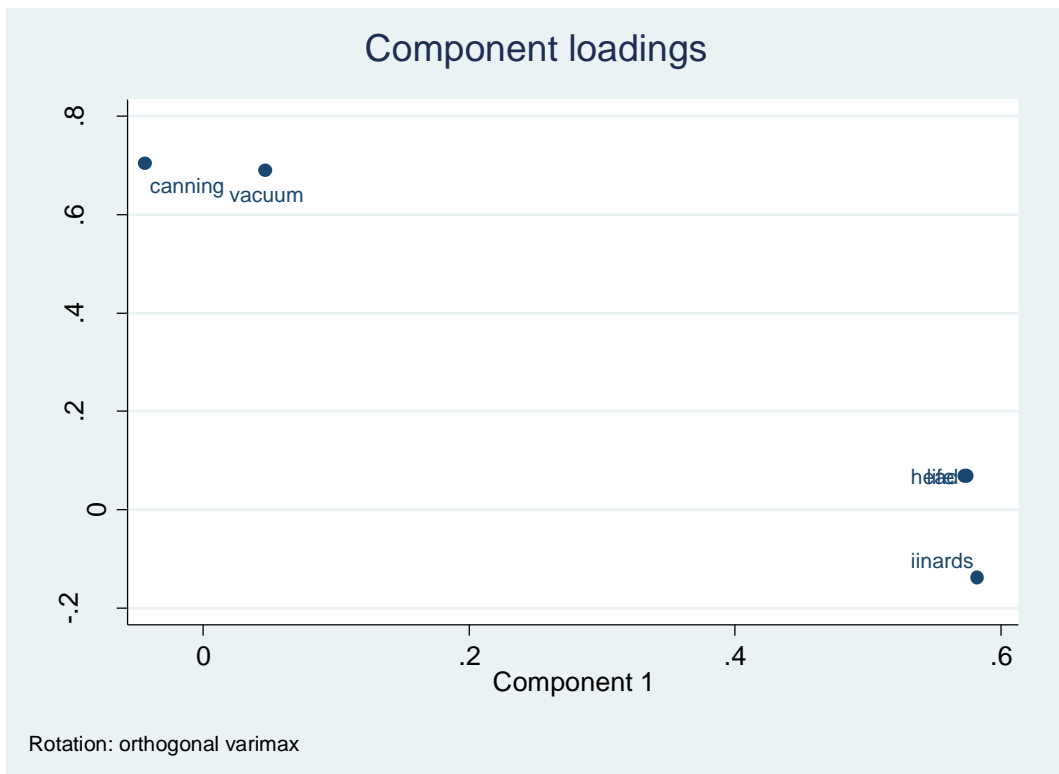
2. What can you suggest to grasscutter farmers to minimize the risks?

Any further comments?.....

Appendix 1.5: Log transformation of dependent variable (risk management) and five resilience variables



Appendix 1.6: Graph showing component loadings after varimax rotation



Appendix 1.7: PCA score variables and score labels

