UNIVERSITY OF CAPE COAST

DETERMINANTS OF MUSHROOM COMMERCIALISATION AMONG SMALL-SCALE MUSHROOM PRODUCERS IN SELECTED MUNICIPALITIES IN THE GREATER ACCRA REGION OF GHANA

EMMANUEL ANOBIR MENSAH

2021

UNIVERSITY OF CAPE COAST

DETERMINANTS OF MUSHROOM COMMERCIALISATION AMONG SMALL-SCALE MUSHROOM PRODUCERS IN SELECTED MUNICIPALITIES IN THE GREATER ACCRA REGION OF GHANA

BY

EMMANUEL ANOBIR MENSAH

Thesis Submitted to the Department of Agricultural Economics and Extension, School of Agriculture, University of Cape Coast, in Partial Fulfilment of the Award of the Master of Philosophy Degree in Agricultural Extension

NOVEMBER, 2021

DECLARATION

Candidate's Declaration

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

Candidate's Signature: ……. Date……

Name: Emmanuel Anobir Mensah

Supervisor's Declaration

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

Supervisor's Signature……...…. Date……

Name: Dr. Albert Obeng-Mensah

ABSTRACT

The Ghana government has been pursuing the commercialisation of mushrooms since 1990, in accordance with the Food and Agriculture Sector Development Policy (FASDEP), which aims to promote the commercialisation of smallholder farmers. The study explored the drivers of mushroom commercialisation in the Ga East and Adentan municipalities in the Greater Accra region of Ghana. The study used a structured interview schedule to collect data from 153 mushroom producers in the study area, using a quantitative research approach, cross-sectional survey design and census. The data were analysed using frequencies, percentages, means, standard deviations, Ordinary Least Squares regression, Garret ranking and Principal Component Analysis (PCA). The study revealed that all the mushroom producers had received formal education and were on average 48 years old. The mean annual intensity and degree of mushroom commercialisation, respectively, were 75 percent and GHS 10202.29. Social awareness, market incentives, and the economic value of mushrooms motivated mushroom commercialisation, whereas institutional constraints and personal weaknesses, value chain challenges and market uncertainty inhibited it. The key Food Research Institute (FRI)'s contributions to mushroom commercialisation were training on production technologies and spawn supply, with annual income, economic value of mushroom, challenges in mushroom value chain and hired labour determining the degree of mushroom commercialisation. Stakeholders should encourage the youth to cultivate mushroom and enhance training in production technologies, spawn production, establish a market hub, raise mushroom awareness and strengthen the mushroom value chain.

KEY WORDS

Agricultural commercialisation

Ghana

Greater Accra region

Mushroom

Mushroom commercialisation

Producers

ACKNOWLEDGEMENTS

To God be the glory, great things He has done!

My sincerest gratitude first goes to Dr. Albert Obeng-Mensah (Supervisor), for his guidance in the conceptualization and writing of this thesis, and also for the fatherly love and care he showed towards me throughout the thesis period.

I also express my deepest appreciation to my late father, Mr. Joseph Mensah and my uncle, Mr. Samuel Egyam, for providing the financial support for completing this thesis.

Furthermore, I express my sincerest gratitude to the lecturers at the Department of Agricultural Economics and Extension, for equipping me with the requisite knowledge to help me write this thesis.

Again, my heartfelt gratitude goes to Dr. Rebecca Owusu Coffie, Dr. Emmanuel Inkoom and Mr. Isaac Kwesi Asante, for their worthwhile inputs and constructive criticisms to shape this thesis.

Also worthy of appreciation is my mother, Madam Sophia Egyam, my siblings and my beloved fiancée, Grace Rockson, for supporting me spiritually, socially and psychologically to complete my thesis successfully.

Finally, I am highly indebted to Dr. Asantewaa Aboagye McCarthy for proofreading this thesis.

DEDICATION

In memory of my late father, Mr. Joseph Mensah.

TABLE OF CONTENTS

CHAPTER TWO: LITERATURE REVIEW

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS

AMA:	Accra Metropolitan Assembly
BUSAC:	Business Sector Advocacy Challenge
CSIR:	Council for Scientific and Industrial Research
EU:	European Union
FRI:	Food Research Institute
GDP:	Gross Domestic Product
GEPC:	Ghana Export Promotion Council
GHC:	Ghana Cedis
HCI:	Household Commercialisation Index
IFAD:	International Fund for Agricultural Development
IFPRI:	International Food Policy Research Institute
KMO-MSA:	Kaiser-Meyer-Olkin Measure of Sampling Adequacy
MoFA:	Ministry of Food and Agriculture
MU:	Mushroom Unit
MUGREAG:	Mushroom Growers and Exporters Association of Ghana
NMDP:	National Mushroom Development Project
NTFP:	Non-Timber Forest Product
OLS:	Ordinary Least Square
PCA:	Principal Component Analysis
SD:	Standard Deviation
SDG:	Sustainable Development Goal
SSA:	Sub-Saharan Africa
USAID:	United States Agency for International Development

VIE: Valence Instrumentality Expectancy

ZERI: Zero Emissions Research Initiatives

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

The World Vision International (2021) reports that there are 805 million people in the world who are food insecure, with 791 million (98 %) living in developing nations like Ghana. In Ghana, approximately 5% of the population is food insecure, with another 2 million people at risk (Darfour & Rosentrater, 2016). According to MoFA (2007), the food insecurity situation in the country is mainly due to limited food and limited alternative sources of income, and one way to salvage the situation is agriculture, as stated by Gassner, Harris, Mausch, Terheggen, Lopes, Finlayson and Dobie (2019) that agriculture in Africa is anticipated to achieve two goals: produce food and assist people to escape poverty.

Agriculture remains the major source of livelihood in Ghana, and it contributes immensely to the country's economic growth. Although Ghana's agriculture industry has shrunk in size by half over the last decade, accounting for 15.3% of GDP as of the second quarter of 2019, the sector retains its strategic importance as a significant employer, employing 44.7 percent of the country's workforce (Mzali, 2020). The agricultural sector of Ghana is dominated by the crop subsector, with cocoa, oil palm, rubber, and citrus as the main cash crops; while maize, cassava, plantain, yam, cocoyam, rice, sorghum, and millet are the principal foods, accounting for 3.40 million hectares (Mha) of total cultivated land (Adjei-Nsiah, n.d.). According to FAO (2017), the agricultural sector has been on the quest for discovering and developing more economic crops that are

climate resistant. One such crop which has been discovered and introduced in Ghana, and has been met with greater appreciation by many Ghanaians as a potentially reliable and sustainable source of livelihood is mushroom (Obodai, 2000).

Mushrooms are described globally as a cash crop and plays a major role in food security and quality of human health due to their known medicinal, nutritional and economic value around the world (Zhang, Geng, Sheng, Wang & Dai, 2014). In Ghana, mushroom cultivation is viewed as a promising agribusiness venture and a good source of nutrients for healthy development, specifically protein, amino acid and vitamins (Kortei, Odamtten, Obodai, Wiafe-Kwagyan & Prempeh, 2018).

Despite the global economic importance of mushroom production, mushrooms were initially gathered from the wild and produced using the conventional pit method, which gave low and inconsistent output, in Ghana (Obodai, 2000). In the 90s, mushroom cultivation improved, with a focus on commercialisation, after the National Mushroom Development Project (NMDP) was established through the collaboration of the Food Research Institute of the Council for Scientific and Industrial Research (CSIR-FRI), Ghana Export Promotion Council (GEPC) and the Ministry of Food and Agriculture (MoFA) in June 1990 to spearhead the commercialisation agenda (Obodai, 2000). This was consistent with the country's Food and Agriculture Sector Development Policy (FASDEP) which seeks to promote smallholder farmers' commercialisation (Martey, Al-hassan & Kuwornu, 2012). Through research and commercialisation, the NMDP, now the Mushroom Unit of the CSIR-FRI,

Ghana, aims to systematically establish and encourage the intensive production, use and export of mushrooms (Obodai, 2000).

Mushrooms commonly produced in Ghana are *Agaricus spp.* and *Pleurotus ostreatus,* however, *Pleurotus ostreatus* (Oyster mushroom) is the popular choice for both producers and consumers in Ghana, according to Obodai, Dzomeku, Narh and Takli (2015). Kortei et al. (2018) and Miles and Chang (2004) have revealed that oyster mushroom is relatively simple and inexpensive to cultivate, and it can grow on a wide range of agricultural substrates. According to Oei (1991), the mushroom growing technique is an environmentally beneficial approach for bioconversion of non-edible plant biomass into a nutritious and relatively simple and easy-to-produce, value-added product. Guillamón, García-Lafuente, Lozano, Rostagno, Villares and Martínez (2010) found that cultivated mushrooms had higher levels of proteins, vitamins, dietary fiber, and inorganic minerals than other high-value food resources (e.g. vegetables). Mushroom protein content is estimated to be between 21 and 40 percent which is similar to soybeans and peas, which have a dry protein value of about 42 percent (Technical Centre for Agricultural and Rural Cooperation (TCARC) 1992). According to Roupas, Keogh, Noakes, Margetts and Taylor (2012), cultivated mushrooms also significantly improve the immune system of humans to fight cancers, viral infections (including HIV), diabetes, constipation and cardiovascular diseases, while Obodai et al. (2015) concluded that cultivated mushrooms provide a reliable source of protein and supplement the mineral and vitamin sources available to all Ghanaians. For this reason, there is a large local demand for cultivated mushrooms in Ghana, as well

as an increasing interest in the cultivation of mushrooms (Obodai, Ofori, Dzomeku, Takli, Komlaga, Dziedzoave, Narh, Prempeh & Sonnenberg, 2014; Obodai et al., 2015).

Kubi (2010) asserts that the socio-economic benefits and potential contribution of mushrooms to Ghana's GDP have attracted the attention of local and international development agencies, who have been implementing mushroom-related programmes to supplement NMDP's effort. For example, in 2016, the Business Sector Advocacy Challenge (BUSAC) sponsored a skills development programme to equip the members of the Mushroom Growers and Exporters Association of Ghana (MUGREAG) with mushroom production, costing, marketing and financial management skills (BUSAC Report, 2019). Again, in 2019, the European Union (EU) launched a four-year agricultural programme (2019-2022) in the Nkoranza North District of the Bono East Region to boost local economic growth and development through mushroom production for jobs creation. The project entails the construction of a modern agribusiness incubation center, a spawn laboratory, and commercial mushroom production villages (Adu-Gyamerah, 2019). Furthermore, ActionAid Ghana implemented a mushroom production training programme in two municipalities in the Greater Accra Region of Ghana aimed to improve the informal sector's growth (Lomotey, 2019). All these efforts aim to promote the commercialisation of mushroom in Ghana.

The above efforts to improve the mushroom industry of Ghana is in part because unlike the traditional agronomic enterprises which are typically mono-seasonal and rainfed, mushrooms can be grown all year-round, and in enclosed

structures, where the producer has control over the climate (temperature, light, and humidity) (Jaleta, Gebremedhin & Hoekstra, 2009). This type of agricultural diversification, according to the Zero Emissions Research Initiatives (ZERI) (2015), has the potential to mitigate the effect climate change has on rain-dependent agriculture. Mushroom production also enables rural, urban and peri-urban dwellers to earn returns in a relatively short time. Compared with a single cycle of producing maize which requires four to six months, two to three mushroom cultivation cycles can be completed within the same cycle (ZERI, 2015). Moreover, mushroom production requires relatively little space, as established by TCARC (1992) that in Ghana, a cropping house on a 5 by 5-meter plot yields 5 to 10 kilograms each day, compared with a yield of 1.2 - 2.5t/ha of soybeans. Given these advantages, several Sub-Saharan African (SSA) countries have incorporated mushroom farming into their agricultural systems since the early 2000s (ZERI, 2015).

Although cultivated mushrooms are primarily consumed by the urban working class and those with special dietary requirements (Weatherspoon & Reardon, 2003), Kortei et al. (2018) report that mushrooms are a delicacy for almost all Ghanaians, regardless of their place of residence. However, local production has been reported to be low, averaging 758 tonnes (687.65 metric tonnes) per annum (Mushroom – PO – Ghana, 2017). This implies that the supply of mushroom is also low, which confirms Obodai et al. (2015)'s report that mushroom supply in Ghana is far below demand. According to Tridge (2021), a total of 28,470 metric tonnes and 28,690 metric tonnes of oyster mushroom were imported into Ghana in 2018 and 2019 which corresponded to

$78,460 and $64,520 respectively. These statistics show that more mushroom is demanded than is produced in the country, which supports the assertion by Obodai et al. (2015) that demand for mushrooms in Ghana far outweighs supply.

Considering the enormous local and international market for mushrooms as well as the increasing investment in the industry by both public, private, and international development agencies, it is imperative to improve the commercialisation of mushrooms in Ghana, particularly in the Greater Accra Region, to pace up with demand. Greater Accra Region is the origin of mushroom production in the country and is home to the major government institutions like CSIR-FRI in charge of promoting mushroom production and development. Mushroom farmers in this part of the country can, therefore, have easier access to information, training, and inputs. Furthermore, the region is home to the majority of the country's middle-class residents, who are the largest consumers of mushroom products and a favourable source of market for mushrooms.

According to Poulton (2018), the process of agricultural commercialisation involves the increase in the proportion of agricultural production sold. Through this process, farmers shift from a subsistence to a more market-focused agricultural production system informed by consumer demands (Seyoum et al., 2011). Gebreselassie and Sharp (2007), Saha, Sabates-Wheeler and Thompson (2021) define agricultural commercialisation as the increased volume (value) of crop sales. Commercial agricultural production, according to Von Braun and Kennedy (1994), is a feature of agricultural change that occurs on both the output and input sides of production, with an increased

marketed surplus (volume or value of produce sold) for the former, and increased use of purchased inputs for the latter. It is the result of farmers making decisions in production and marketing at the same time to maximize profits. Jaleta, Gebremedhin and Hoekstra (2009) reveal that commercialisation brings about welfare gains through the realisation of comparative advantages, economies of scale, and the dynamic technological, organisational and institutional change effects that arise from the flow of ideas due to exchange-based interactions.

External factors such as infrastructure, level of urbanisation, technological change and product demand can influence the success of product commercialisation for small-scale farmers (Nepal & Thapa, 2009; Newton, Schreckenberg & Marshall, 2006; te Velde, 2004; von Braun, 1995). Also, farm-level factors such as landholding, the extent of land-use diversification, level of input use, and intensity of management are found to influence agricultural commercialisation (Hichaambwa & Jayne, 2012; Newton et. al., 2006; Tipraqsa & Schreinemachers, 2009).

The commercialisation of mushroom production in this study, therefore, refers to the increased volume (value) of mushroom output sold to maximise profit. According to Rosmiza, Davies, Aznie, Jabil and Mazdi (2016), Commercial mushroom farming, like any other agricultural production, necessitates a high level of management input and competence to ensure a consistent yield of uniform, high-quality, and marketable products. Other influencing factors are the availability of inputs (spawns and growing media), modern technology, the involvement of government institutions and non-

governmental organisations (Grimm & Wösten, 2018), transaction cost (distance to input sources and output markets), government policies, type of cropping house, type of supplements used, socio-demographic and farmer-related factors (Mabuza, Ortmann & Wale, 2013), food safety regulations (Higgins, Margot, Warnquist, Obeysekare & Mehta, 2017), producers' competencies and production and marketing factors (Schunko, Lechtaler & Vogl, 2019). Thus, factors ranging from household characteristics to broader institutional and policy environments can either stimulate or deter the commercialization of mushroom production.

1.2 Statement of the Problem

The Mushroom Unit (MU) of the Council for Scientific and Industrial Research-Food Research Institute (CSIR-FRI) spearheads Ghana's mushroom industry, with the Ministry of Food and Agriculture (MoFA) and other private and foreign development organisations supporting. The CSIR-FRI produces spawns, provides training on production technologies, offers extension and farm visiting services and produces compost bags for sale (Obodai et al., 2015), while the private, foreign development organisations and other local government organisations mainly fund mushroom training programmes. Despite these efforts, smallholder mushroom producers are reported to be subsistence-oriented (Shem, 2018; Adu-Gyamerah, 2019), and only 758 tonnes (687.65 metric tonnes) of mushroom is produced in Ghana annually (Mushroom – PO – Ghana, 2017). This implies that the majority of mushrooms produced in the country are consumed by farmers and farm households and that small-scale

mushroom producers can barely benefit from livelihood gains associated with mushroom commercialisation.

Research on agricultural commercialisation in Ghana has focused mainly on the major staple crops (cassava, maize, rice, groundnut) and a few cash crops like cocoa and pineapple, with very little work done to explore the determinants of mushroom commercialisation. This conforms to Zhou, Minde and Mtigwe (2013) who lamented that empirical studies on agricultural commercialisation have concentrated only on the staple crops and livestock. For example, Abu (2015) investigated the factors influencing the intensity of smallholder groundnut farmers' market participation in the Upper West Region and discovered that the farmers were moderately commercial, selling an average of fifty-three percent of their output in a production year. The study identified marital status, the quantity of output, mobile phone ownership, credit access, access to market information and form of sale as determinants of groundnut market participation while unfavourable market prices, poor road networks to market centers, inadequate market infrastructure and market uncertainties constituted the major impediments to groundnut commercialisation in the region.

Martey, Al-hassan and Kuwornu (2012) studied maize and cassava commercialisation in the Central Region of Ghana, and, similar to the findings of Abu (2015), the maize farmers in the region were moderately commercial, with a commercialisation index of 53%, whereas the cassava farmers in the region were highly commercial with a commercialisation index of 72%. The study revealed that output price, farm size, households with access to extension

services, distance to market and market information determined the extent of commercialization maize and cassava commercialisation.

Moreover, Abdullah, Rabbi, Ahamad, Ali, Chandio, Ahmad, IIyas & Din (2019) explored the effect of rice commercialisation on the welfare of smallholder rice farmers in Ghana and discovered that gender, age, number of family members who assist in farming, household size, vocational training, the farmer being the landlord and farm size determined rice commercialisation. The study concluded that commercialisation can be enhanced by subsidized prices for production, availability of cold storage houses, vocational training, the introduction of new technology, increment in contact times with extension agents and provision of genetically modified seeds.

However, the intensity and the degree of mushroom commercialisation, and what the predicting factors are for the former, are not known. Also, only a few studies (Barney, 1973; Mutema, Basira, Savadye & Parawira, 2019) have been carried out to reveal the psychosocial factors that may stimulate or deter farmers to produce and sell mushrooms. It is upon these premises that this study is imperative.

1.3 General objective of the Study

The general objective of this study was to identify the determinants of commercialisation of mushroom production among the small-scale mushroom producers in the Ga East Municipality and the Adenta Municipality in the Greater Accra region.

1.4 Specific objectives of the Study

To achieve the general objective, the study specifically:

1. Described the background characteristics of the mushroom farmers in the Ga East and Adentan Municipalities in the Greater Accra region.
2. Described the state of mushroom commercialisation in the study area.
3. Identified the motivating factors (external internal and psychosocial) of mushroom commercialisation in the study area.
4. identified the inhibiting factors (external, internal and psychosocial) of mushroom commercialisation in the study area.
5. Identified the key contributions of CSIR/FRI towards mushroom commercialisation in the study area.
6. Determined the factors that account for the degree of mushroom commercialisation among the small-scale mushroom producers in the study area.

1.5 Research Questions

To achieve the specific objectives of the study, the following questions are formulated to guide the studies:

1. What are the background characteristics of the mushroom farmers in the study area?
2. What is the state of mushroom commercialisation in the study area?
3. What are the motivating factors that drive mushroom commercialisation in the study area?
4. What are the inhibiting factors that hinder mushroom commercialisation in the study area?
5. In which areas are CSIR-FRI contributing towards mushroom commercialisation in the study area?

6. What sociodemographic and farmer-related characteristics predict the degree of mushroom commercialisation in the study area?

1.6 Research Hypotheses

1. H_0: Sociodemographic characteristics do not significantly influence the degree of mushroom commercialisation.

   H_1: Sociodemographic characteristics significantly influence the degree of mushroom commercialisation.

2. H_0: Motivating factors do not significantly influence the degree of mushroom commercialisation.

   H_1: Motivating factors significantly influence the degree of mushroom commercialisation.

3. H_0: Inhibiting factors do not significantly influence the degree of mushroom commercialisation.

   H_1: Inhibiting factors significantly influence the degree of mushroom commercialisation.

1.7 Significance of the Study

The Ghana government has launched a major mushroom commercialisation initiative through the Mushroom Unit of the Food Research Institute (FRI) of the Council for Scientific and Industrial Research (CSIR), Ghana, to make Ghana a leading exporter of mushrooms (Obodai, 2000). This aim has not been fully realised, and this study contributes to identifying the factors that hinder the mushroom industry for policy action to enhance facilitate mushroom commercialisation which will result in the improved livelihood of farmers and socio-economic development of Ghana in general.

Furthermore, in line with the Ghana Poverty Reduction Strategy (GPRS) II policy goal to facilitate smallholder agricultural commercialisation through improved agricultural marketing, this study will provide empirical evidence on the factors that influence small-scale mushroom farmers' extent of commercialisation, which is pivotal to informing policy priority setting to enhance agricultural transformation and poverty reduction.

This research also furthers academic discourse on agricultural commercialisation by revealing, empirically, evidence to supplement the scant literature available on smallholder commercialisation of agricultural produce, particularly non-traditional agricultural enterprises such as mushroom production in Ghana.

Furthermore, this study provides insights into the sociodemographic and farmer-related characteristics that predict the degree of mushroom commercialisation in the Greater Accra region.

Moreover, the study explores psychosocial factors that drive or hinder mushroom commercialisation, which will have to be validated, confirmed while quantifying their effect on the degree of mushroom commercialisation by future studies.

Additionally, the study provides guidelines for current and potential mushroom producers for commercialising their enterprise.

1.8 Limitation of the Study

Because farmers could not keep proper records, the study had to rely on their memory recall, especially for variables like yield and other farm-related

parameters. Farmers' recollection could have an impact on the quality and precision of data on their yields as well as the amount of inputs they use.

1.9 Delimitation of the Study

The study was conducted to reflect only the chosen research topic, as well as the study's objectives and answers to the research questions. Furthermore, the research did not extend beyond the scope of the study area.

Again, only mushroom farmers registered with MUGREAGE in the study area were sampled for the study, and thus analyses were based solely on the farmers who were sampled in the study.

1.10 Definition of key terms

Commercialization: It is the process of increasing the volume or value of mushrooms sold to increase income**.**

The intensity of commercialization: It is the percentage of output sold.

Degree/scale of commercialization: It is the volume or value of output sold.

Mechanized incubation room*:* a chamber or a room for keeping spawned compost bags that has a temperature control system installed to regulate temperature.

Mechanized cropping house*:* A room or a chamber where colonised bags are grown which has a humidifier installed to regulate humidity.

CSIR-FRI's contribution to mushroom commercialization: services provided by CSIR-FRI from which mushroom farmers benefit most towards commercial production of mushroom.

Motivation for mushroom commercialization: it is the external and internal factors including psychosocial factors that drive farmers to produce and sell mushroom.

Inhibition to mushroom commercialization: it is the external and internal factors including psychosocial factors that impede mushroom commercialization.

Small-scale mushroom farmer: A mushroom producer supplying less than 15000kg of mushroom to the market per annum.

Commercial mushroom farmer*:* A mushroom farmer who supplies 15000 kg and above mushrooms to the market annually.

Psychosocial factors: They are factors relating to the social environment of an in individual as well as individual thoughts and behaviour.

Production level: it is the average volume of value of mushroom produced per annum.

Market: a place where the mushroom is sold.

1.11 Organisation of the Thesis

This thesis is divided into five (5) chapters. The first chapter (1) provides the context for the study, focusing on Ghana's agricultural sector's performance in international trade and economic development and the economic benefits of mushrooms. This chapter also articulates the problem statement before defining the study's objectives, hypotheses, and rationale.

Chapter two (2) contains reviewed literature. This includes extensive work by authorities on smallholder farmers' agricultural commercialisation (market participation). The methodology used in carrying out the study is

presented in Chapter Three, while Chapter Four presents the thoroughly discussed results of the study. In Chapter Five, the study's major findings, conclusions, and policy recommendations are provided.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviewed and brought together the existing theoretical, conceptual and empirical research that served as the study's foundation. It contains an extensive review of literature on non-traditional farming in Ghana, global mushroom production and promotion, concepts of agricultural commercialisation, the relevance of small-scale agricultural commercialisation, and the concept of mushroom commercialization. Also, theoretical and empirical reviews were done on the factors affecting agricultural commercialisation, and motivation for agricultural commercialization in this chapter. The Chapter has also highlighted the household non-separable commercialisation behaviour model and Vroom's expectancy theory and has also reviewed the literature on the analytical tools used to analyse the study's data.

2.2 The non-traditional farming in Ghana

Non-traditional farming refers to the farming of a host of agricultural commodities such as fresh fruits and vegetables, the gathering of non-timber forest products (NTFPs) from plant and animal sources, natural forests, manmade plantations, wooded land, farmlands, trees outside forests and the domestication of these products (Ahenkan & Boon, 2010; Takane, 2004). These products are referred to as non-traditional because of their recentness on local and export markets as compared to traditional crops like cassava, rice, yam, cocoa, coffee, maize, and so on (Takane, 2004). Notable non-traditional farming

enterprises in Ghana are pineapple production, cashew production, mushroom production, honey-beekeeping, rabbit rearing, grasscutter rearing and snail rearing.

The commercialisation of non-traditional enterprises has become imperative in Ghana and is being recognized by conservation and development organisations as a potential source of income for rural poor and an additional source of income for urban and peri-urban dwellers (Ahenkan & Boon, 2008; Arnold & Pérez, 2001; Marshall et al., 2003). For this reason, the collection, production and marketing of these enterprises is embraced in Ghana and is being promoted as a potential solution to malnutrition, poor health of the especially rural population and the spread and intensification of poverty (Ahenkan & Boon, 2008; Angelsen & Wunder, 2003).

As in other African countries, the export of some non-traditional enterprises, especially fruits and vegetables from Ghana, has rapidly increased since the mid-1980s as a result of the country's adoption of structural adjustment programs (SAP) and a series of policy changes toward economic liberalization since 1983 (Takane, 2004). The export agricultural sector of Ghana in the past century depended heavily on cocoa, a traditional export crop. However, under the SAP, both the government of Ghana and the international donor communities have encouraged the nontraditional enterprise sector to promote diversification of the country's agriculture (Takane).

2.3 Promotion of mushroom production at the global level

2.3.1 The case of Asia

China is the world's biggest mushroom producer, accounting for more than 85 percent of global production. Although it consumes practically all that it produces, with only around 5% exported to other Asian countries, China has more mushroom types than any other country (Chang & Wasser, 2017). Many species of mushrooms, including Auricularia auricula-judae (600 AD) and Flammulina velutipes (800–900 AD) were first successfully cultivated in China (Chang & Wasser, 2017). China cultivated mushrooms as early as 600 AD, according to Rühl and Kües (2006), through artificial inoculation of twits with *Auricularia auricula-judae*.

According to experts, China's progress as the world's biggest producer, user, and exporter of mushrooms can be due to several causes. The most important factor for China's success is its excellent scientific backing from academic institutions (Chang, 2005). As a result, new advances in manufacturing, storage, and the development of market-preferred varieties have been discovered. A study conducted by Li and Hu (2014) revealed that China's mushroom industry is dominated by small-scale farmers who account for about 90% of mushroom output, with large-scale commercial production accounting for just over 10%.

Since 2001, India's yearly mushroom production, on the other hand, has doubled, from 5,000 tons to 10,000 tons in 2014. The relative increase in output can be attributed to the medicinal and the greater market values of particular selected varieties (Chang et al., 2017). Shirur, Gowda, Chandregowda and Rana

(2017) assert that the button mushroom is the most popular kind in India. The Indian government has been encouraging mushroom development in Himachal Pradesh by implementing programmes that will boost its production because of the importance of the mushroom business to the livelihood of its citizens (Vaidya, 2001) cited in (Agyeman, 2019).

2.3.2 The case in Europe

In the 18th century, France pioneered modern mushroom growing in Europe (Fresh, 2000) cited in (Agyeman, 2019). In Germany, the production of mushrooms from tree stumps and logs began as an experiment. High-tech equipment dominated the European mushroom industry. The Netherlands, Poland, and Spain were the top producers and exporters of fresh and processed mushrooms in Europe. In 2011, the Food and Agriculture Organization forecasted increased output growth for countries including France, the United Kingdom, and Germany from 2011 to 2017 (NHB, 2005) cited in (Agyeman, 2019).

2.3.3 The case of Southern and Northern America

The United States of America (USA) is the world's second-largest mushroom producer. It accounts for around 16 percent of global output. In terms of production value, mushrooms are the most valuable specialty crop in the United States. Only potatoes, lettuce, and tomatoes are ahead of mushrooms. The mushroom per capita consumption in the United States grew from 0.6 pounds in 1965 to 4.0 pounds in 2011 (Jiang, House, Tejera & Percival, 2015). Fresh mushroom consumption has grown per capita in the United States, whereas processed mushroom consumption (mainly canned) has fallen.

Countries including Canada, Mexico, China, and Korea controlled the fresh mushroom industry in the United States. Mushroom cultivation became popular throughout the Caribbean in the 1990s. Several Caribbean countries, according to Paulraj and Francois (1995), produced a lot of agricultural waste that might be used to grow mushrooms in big quantities. In Jamaica, waste materials from coffee was used in the production of mushrooms (oyster), while straws from rice were used in Trinidad, and bagasse and banana trash were used in Dominica and St Lucia, respectively (Paulraj & Francois, 1995).

2.3.4 The case of Africa

Although Africa has 25% of the world's mushroom biodiversity, it contributes only 0.4 percent to the production and sales of mushrooms globally, according to Anchang (2014). In Tanzania, a huge number of by-products from sisal, sugar cane, and cereals are produced, which might be used as a substrate for growing mushrooms. The country's adoption of oyster mushroom cultivation has been rising gradually, and as a result, the Ministry of Agriculture and Cooperatives introduced and financed mushroom cultivation in 1993. Also, the Applied Microbiology Unit of the University of Dar es Salaam was charged to conduct mushroom-specific research to encourage the adoption of mushroom culture and technology in Tanzania (Chuwa, Kivaisi & Srivastava, 1996; Kivaisi, Magingo & Mamiro, 2003; Mshandete, 1998).

In West African nations including Nigeria, Côte d'Ivoire and Ghana, wastes from cocoa, oil palm, maize and cassava generated every year amount to 9 million metric tonnes. It has been that revealed if one-fourth of this by-product was used to cultivate mushrooms, nearly 1.2 million metric tonnes of fresh mushroom might be produced every two (2) months (Rašper, 1969). In Nigeria, mushroom production is prevalent, with farmers cultivating both medicinal and edible mushrooms, *Agaricus bisporus* and *Pleurotus Sp* being the most commonly cultivated mushrooms (Ndem & Oku Martha, 2016).

2.3.4.1 The case of Ghana

Most Ghanaians, according to Sawyerr (1991) cited in Agyeman (2019), use mushrooms as a meat and vegetable substitute. This enhances food security and expands food sources in the country. With about 7000 farmers producing mushroom in Ghana, non-viable lands are well utilised to create job in both rural and urban regions (Bempah, 2011) cited in (Agyeman, 2019). The Ghana government, after recognising the importance of mushroom production to the livelihood of the its citizens, intiated the NMDP in 1990 (G.E.P.C., 1992) cited in Agyeman (2019), to establish Ghana as a significant player in the mushroom export business. Since then, mushroom farming has risen in popularity, with some international development organizations advocating it as a means of reducing poverty in the country's rural and peri-urban areas (Obodai, 2000).

Research on mushroom cultivation in Ghana has revealed that mushroom is predominantly produced in urban areas, with only a handful in rural areas. This has been largely attributed to the fact that most rural residents harvest edible mushrooms from the wild, which are mostly consumed by the

rural households, with a few surpluses sold in metropolitan markets (Apetorgbor, Apetorgbor & Nutakor, 2005).

2.4 The Concept of Agricultural Commercialisation

Gebremedhin and Jaleta, (2010) and Goshu, Kassa and Ketema (2012) admit that agricultural commercialisation lacks conceptaul clarity among scholars, and as a result, many definitions have evolved. According to Zhou et al. (2013), these definitions differ in emphasis and breath, which also influence its calculation. However, Leavy, Poulton and Poulton (2008) maintain that cash remains at the center of all almost the definitions of agricultural commercialisation (output market participation). For example Pradhan, Dewina and Minten (2010) define agricultural commercialisation as the process of increasing the amount of agricultural output that is marketed. This definition emphasises the volume (quantity or value) of the output sold and that irrespective of whether all output is sold or a proportion of it sold, the sale volume must meet a set threshold before one can reach the commercial level. Govereh, Jayne and Nyoro (1999) concur with Leavy et. al (2008) and Pradhan, et. al (2010), and define agricultural commercialisation as the amount of agricultural products sold. Sharing in the same view, Gebreselassie and Sharp (2008) and Saha et al. (2021) define agricultural commercialisation as the volume (value) of crop sales. Using the amount or volume/value of output sold as a proxy for agricultural commercialisation, Kakeya and Sugiyama (1987) in their Integrated Rural Development Program (IRDP) studies in Northern Province, Zambia, classified commercialised farmers as those who sold more than 30 bags of maize per annum.

Poulton, Dorward and Kydd (2010) however, give less credence to the volume or value of sale featuring in most definitions of agricultural commercialisation, but regard agricultural commercialisation as production aimed at the consumer, regardless of size or form of crop. Pingali and Rosegrant (1995) maintain that commercialisation of agriculture includes not only the marketing of output but is also concerned with the choice of product to produce and the input decisions that producers make, with profit maximization in mind. Additionally, Jaleta et al. (2009a) view agricultural commercialization to imply a transition from the production of agricultural commodities on a subsistence basis to market-oriented production by making decisions on the choice of products product to produce and the inputs used to produce them, to increase marketable surplus for profit maximisation.

This transition, according to Jaleta et al. (2009), occurs within agricultural enterprises or the agricultural sector in general when farmers begin to depend largely on input and output markets for production. Owing to this definition, Jaleta et al. identified increasing domestic demand for agricultural products for both consumption and agro-processing purposes and increasing opportunities for the export of agricultural products as the main drivers for agricultural commercialization. Agricultural commercialisation results when stakeholders like farmers, input suppliers, traders and processors decide based on these drivers. When one realises the competitive advantages, economies of scale, and the complex technical, organizational, and institutional change effects that emerge from the flow of ideas as a result of exchange-based

interactions, agricultural commercialization can result in increased welfare (Jaleta et al., 2009a).

Barrett (2008) makes two inferences about agricultural commercialisation: first, he notes that households can decide to buy from the market or sell to the market. Second, he observes that households' decisions to participate in the output markets are informed by their motivation to increase utility, considering cash income and available non-tradable resources. Agricultural commercialisation, therefore, is a process whereby the aim of agricultural production transitions from subsistence to primarily for sale, with more volume or value of output, supplied to the market (Omiti, Otieno, Nyanamba & McCullough, 2009; Goletti, Purcell & Smith, 2003; Pradhan *et al.*, 2010).

von Braun (1995) maintains that commercialisation of agriculture is a characteristic of agricultural change and it extends beyond the presence or the absence of cash crops to a certain degree in a production system. von Braun (1995) further states that agricultural commercialization may take place on the output side of production, resulting in more excess for sale, or on the input side, resulting in more input use.

2.5 Defining mushroom commercialisation

The precise definition for mushroom commercialization has not been agreed upon by scholars, however, commercial mushroom production is viewed as increasing the cultivation of specialty mushrooms for the market to increase income other than gathering from the wild. Thus, mushroom commercialization features the production of mushrooms on a larger scale to meet demand

(Rosmiza et al., 2016). The commercialisation of mushrooms (non-traditional agricultural product), is geared towards increasing mushroom production and volume of mushroom sold by transitioning from gathering from the wild and subsistence production (together referred to as small-scale production) to semi-subsistence and fully commercial (large scale, market-oriented), to increase mushroom yield and output market participation by producers (Barney, 1973).

Following Gebreselassie and Sharp (2008), Saha et al. (2021), Govereh, Jayne and Nyoro (1999), Pradhan, Dewina and Minten (2010) and Kakeya and Sugiyama (1987), in this study, mushroom commercialization is defined as the increased of volume (value) of mushroom sold per annum. A commercial mushroom farmer should produce and sell 15000kg (15 mt) of mushroom per annum (M. Dzomeku, Personal Communication, January 10, 2021) which connotes that a smallholder or small-scale mushroom producer produces below 15000kg (15mt) per annum.

2.6 Concept of a small-scale/smallholder farmer

The term "smallholder" is difficult to define on its own, except with other terms and from many perspectives and as a result, it lacks a precise delineation by scholars. Different countries and agro-ecological zones ascribe different meanings to the term based on their context. Generally, farmers with cultivated land holdings below 1 hector in areas with high population density, or more than10 hectares in semi-arid areas are classified as smallholders (Vermeulen & Cotula, 2010). In the Ghanaian context, Ekaboir, Boa and Dankyi (2002) define a small-holder farmer as any farmer who cultivate land size below five (5) hectors. The Ministry of Food and Agriculture of Ghana also holds that

a smallholder in Ghana is any farmer having below two (2) hectares of cultivated land (MoFA, 2011). Deducing from the definitions above, the central theme is that smallholder farmers are characterised by small cultivated areas of land. Chamberlin (2007) on the other hand, broadens the concept of smallholder farmers by classifying them according to their size, wealth, market orientation, and risk exposure. Dixon, Taniguchi, Wattenbach and Tanyeri-Arbur (2004) define smallholder farmers based on fewer resources at their disposal in comparison with other farmers whereas Chamberlin regards smallholder farmers as having higher vulnerability to climatic and economic shocks.

Additionally, a broader view of a smallholder farmer in agriculture transcends just an area of plots cultivated as noted by Chamberlin but also a farm size of which an area of the plot is a component. Boussard, (1992) notes that a farm size can be demarcated plots to which a farmer has an ownership title or hired with proof of right to it. Again, farm size can be viewed in terms of the "gross income" which depends on the price system, or a "weighted sum of outputs" where the size of the farm depends on the weight of the outputs. Considering these three variables that characterise a farm size, a farmer is said to be a smallholder if he or she is below the threshold of identified plots, gross income or weighted outputs. Undoubtedly, land size is the most commonly used premise for describing smallholders in the literature reviewed, and in Ghana, the standard of measure is taken from MoFA's standard, since it is an authority in the agricultural sector in Ghana agricultural.

However, with regards to this study, a smallholder or small-scale mushroom farmer is viewed based on the total number of bags of substrates

cropped per one cropping cycle. This has a bearing on the gross income, weighted output and the area of land developed for mushroom production. Although numerous literature claims that mushroom production does not need a vast land (Mabuza et al., 2012), this is only true for small-scale, subsistence, and semi-subsistence production. In commercial production, it is logically valid to state that, all factors being equal, larger land size is required for the construction of a larger cropping house and incubation rooms, for example, to increase cropping capacity and translate into more weighted output and income. This part corresponds to the concept of a smallholder farmer in conventional agriculture, where land size is a major defining characteristic.

A small-holder/scale mushroom farmer in this study is defined as a mushroom producer who produces below 15000 kg (15mt) of mushroom per annum or below 5000kg (5mt) per one growing cycle (which takes about two to three months). In terms of land size, smallholder mushroom producers utilize a land size of up to 0.23 acres (Dzomeku, M., personal communication, December 2020).

2.7 Small-scale farming sub-sector and its relevance

The importance of small-scale agricultural farming cannot be underestimated when it comes to the economic development of developing countries. Kirsten and Van Zyl (1998) assert that the potential of small-holder agriculture to generate income and employment in urban, peri-urban and rural areas has been noted internationally. Kirsten and Van Zyl argue that given a supportive policy environment, the small-scale farmers can be very competitive and a viable niche for the development of a future small-scale sub-sector.

Hazell and Rahman (2014) confirm that farming on small scales has the potential for creating jobs, increasing returns on land and labour of the poor people and reducing the price of (staple) foods.

In developing countries, smallholder farmers make up the largest population, and are pivotal to rural livelihood improvement and growth, considering the inadequate resources for rural industrialisation in the majority of developing countries (Govereh et al., 1999). Reiterating the importance of agriculture for development, World Bank (2008) reported that the Hunger Task Force for the Millennium Development in 2005, noted that agriculture is crucial to reducing world hunger by half by 2015, as part of the MDG. Since Developing worlds and especially Africa has a greater part of their population being residents in rural communities and engaging in small-scale farming, it follows that small-scale farming is important in achieving the MDG goal in 2015, and is still relevant to achieving zero hunger in Africa to reach the Sustainable Development Goal (SDG 2) (World Bank, 2008).

The 2007 records from the Independent Evaluation Group of the World Bank indicates that poverty levels in developing countries reduced from 28% to 22% in 2002, and according to the World Bank, this decline is accounted for by the reducing levels of poverty in rural areas (World Bank, 2007). This is confirmed by Baisa (2009) who reported that 80% of the reduction in poverty levels of developing countries is mainly due to good living conditions in rural areas. The World Bank (2007) inferred that there is a huge potential for agriculture to help reduce poverty and enhance economic growth in developing countries. This potential can be attributed to smallholder agriculture because

smallholder farmers make up the majority of farmers in developing countries. Not only is smallholder farming internationally recognised for reducing poverty in developing countries, but it is also noted for being instrumental in combating the food crisis in Africa plagued by perennial food shortages (Rapsomanikis, 2015).

However, for small-scale agriculture to have a substantial impact on economic development, poverty reduction, and food security, commercialisation must be its goal according to Kirsten, May, Hendriks, Lyne, Machete and Punt (2003) and Hendricks and Fraser (2003), who argue that for small-scale agriculture to have a significant effect on poverty reduction and food security, it must be commercialized. According to World Bank 2007, citing Howard et al. (1999) and Palmer (2004), if improved agricultural technologies are adopted, inputs are accessed, and agricultural infrastructure investment is increased, Africa's agricultural income can grow. Although, some authors, for example, Johnson (2017), have expressed reservations about small-scale agriculture contributing significantly to economic growth and poverty reduction, World Bank (2007), citing IFPRI (2002), strongly maintains that there are proofs of smallholder agriculture contributing to livelihoods in Africa; and when given the necessary support services and inputs, can be as efficient as larger farms. Owing to this fact, several countries and international development organizations emphasize the commercialization of small-scale agriculture as a tool for poverty reduction (Leavy & Poulton, 2008).

2.8 Factors Affecting Agricultural Commercialisation

2.8.1 Empirical Review

Much research has been performed on agricultural commercialisation featuring a variety of agricultural commodities to reveal the degree of commercialisation of smallholder farmers in various geographical locations (Ogutu, Gödecke & Qaim, 2020). Empirical evidence reveals that the factors influencing smallholder farmers' commercialisation can be classified as private assets (farmer-household characteristics, owned by farmers), public assets variables (Abu, 2015). Reflecting on the studies by Key, Sadoulet and Janvry (2000) and Barrett (2008), Cazzuffi and Mckay (2012) noted that other important determinants of agricultural comercialisation are: differences in smallholder farmers' assets endowments and their differences in accessing public goods and services that facilitate commercialisation. When it comes to transaction costs, the variables that are commonly considered are distance to market (input and output) and market information, which is primarily price information (Abu, 2015; Gebreselassie & Sharp, 2008).

In their study to identify the factors enhancing smallholder cotton farmers' market participation, Randela, Alemu and Groenewald (2008) observed that market distance and access to market information correlated positively with market participation. Martey et al. (2012) and Omiti et al. (2009) revealed a negative association between market distance and cassava and maize market participation, explained by the fact that market distance determines the cost and time required to get to the market; in such a case, smallholder farmers are discouraged from engaging in the market because of the longer distances.

Further, Martey et al., 2012 and Omiti et al. (2009) discovered that access to market information is negatively associated with market participation. This result, however, contrasts the findings of Siziba et al. (2011) and Randela et al. (2008).

Stephens and Barrett (2011), Siziba et al. (2011) and Martey et al. (2012) have established that household characteristics and/or private asset variables generally have a positive effect on agricultural commercialisation. Siziba *et al.* (2011), for instance, indicated that income from non-farm activities, radio ownership and total livestock possessed by farmers highly and significantly associated positively with the volume of cereal grain sales (cereal grain commercialisation). Age, education, farm size and gender (male-headed households), private assets (communication instrument, bicycle, productive asset), being a member of an association, and crop output are some of the socio-economic characteristics that have been found to correlate positively with agricultural commercialisation (Martey et al., 2012; Olwande & Mathenge, 2012; Omiti et al., 2009; Randela et al., 2008). However, household size is negatively associated with agricultural commercialisation by Olwande and Mathenge (2012). Randela et al. (2008) also discovered a negative relationship between size of farm, livestock ownership and commercialisation.

Additionally, some public asset variables also influence agricultural commercialisation. For example, access to credit and insurance (Stephens & Barrett, 2011), access to extension services (Alene et al., 2008), the market price for output (Olwande & Mathenge, 2012; Omiti et al., 2009) and access to extension training and participation in research (Siziba et al., 2011) have been

found to positively influence agricultural commercialisation. However, Martey et al. (2012) observed a negative association between extension access by both the maize and cassava farmers and market participation.

Ahenkan and Boon (2010) researched the commercialization of non-timber forest products (NTFPs) comprising beekeeping, grasscutter rearing, mushroom production, snail rearing and medicinal plants in Ghana, and observed that unstable price and low output yield, are the major challenges to the commercialization of NTFPs. Rosmiza et al. (2016) examined the prospects of commercial mushroom production in Malaysia and observed that lack of facilities to produce quality compost, casing material, spawn and processed products; lack of new production technology and farm management practices; unstable farm-gate prices and profit margins and short shelf life of mushroom hinder commercial production.

Gateri, Muriuki, Waiganjo and Ngeli (2009) analysed the prospects for commercial mushroom production in Kenya and found that high product price, undiversified product range, low utilization, poor infrastructure, unsustainable supplies, lack and inaccessibility of market information, lack of entrepreneurship skills among farmers, and poor policies and coordination among value chain players constrain mushroom marketing**.** Mabuza et al. (2012) explored the determinants of farmers' participation in oyster mushroom production in Swaziland and revealed that institutional factors including market access, improved awareness, training and mentoring are highly likely to increase oyster mushroom farmers' commercialisation.

2.8.2 Theoretical review

According to Zhou et al. (2013), smallholder agricultural commercialisation can be impacted by factors that promote demand, such as population growth and rapid urbanization, and income growth; changes in the environment, such as global warming, changing rainfall patterns, and water availability; factors that enhance productivity, such as natural resource endowment and suitable agro-ecological conditions; and efficient operational factors, such as appropriate technology, reduced transaction costs and a more integrated value chain; and an increase in individual dedication to commercial operations motivated by entrepreneurial culture.

Zhou et al. (2013) further stated that commercialisation approaches can be categorised into primary driving force or leading change agent. Commercialization efforts can be controlled by one agent or more entities undertaking facilitation or operating roles. This strategy is frequently led by the state, private sector, donor, or a collaboration between these actors. The collaboration combines the efforts of the state, the private sector, and donor agencies, which has proven to be the most successful. A leading driving force for the commercialization process, on the other hand, can be policy, demand, technology, entrepreneurship, or value-chain driven; it can also be a combination of these forces (Zhou et al., 2013).

According to Pingali and Rosegrant (1995), commercialisation of smallholder agriculture can further be determined by either external or internal factors. The external factors include an increase in population and demographic change, technological progress, infrastructure and market institution

development, non-farm sector and broader economic development, growing labor opportunity costs, and macroeconomic, trade, and sector policies (Von Braun et al., 1994; Pingali & Rosegrant, 1995). Other external factors mentioned by Pender et al. (2006) and Jaleta et al. (2009) include the development of input and output markets, institutions such as property rights and land tenure, market regulations, cultural and social factors influencing consumer preferences, production and market opportunities and constraints, agro-climatic conditions, including market and production risks. Poulton (2018) also add that agriculture commercialization is also heavily influenced by public policies and investment from both the government and development agencies

2.8.2.1 Socio-demographic and Farmer-related characteristics

The demographic characteristics of farmers influence them significantly during the process of making farm-related decisions. For instance, Ghadim and Pannell (1999) revealed that the age of household heads correlated negatively with their decision to commercialise mushrooms. This is because younger farmers are perceived to be more progressive, open to new ideas, and often have a better understanding of the benefits of engaging in non-traditional agricultural ventures. Damianos and Skuras (1996) add that although older farmers tend to possess much experience and skills compared to the younger ones, at some point in time, older farmers become relatively less energetic and develop a stronger emotional attachment to the production of conventional or traditional products because of the risk-averse characteristic of most older and experienced farmers (Ghadim & Pannell, 1999). Regarding gender, it is generally believed that women in Africa play a significant role in agriculture which justifies their

openness to innovations than men (Chipande, 1987). However, Doss and Morris (2000) discovered that access to resources, rather than gender, influences farmers' production decisions. If, for example, mushroom production is solely dependent on knowledge gained through training, and only women are permitted to receive training in a given community, then mushroom production will not benefit men and women equally in that context. Although this is an empirical finding, it contradicts the findings of numerous agricultural commercialisation studies, which found that gender was positively correlated with the degree of agricultural commercialisation (Omiti *et al.*, 2009).

Although indigenous knowledge is important in agriculture, farmers' formal education level is frequently used to indicate their ability to acquire, process, and effectively apply mushroom commercialisation information. This assumption is based on the fact that formal education improves learning, which presumably fosters positive attitudes toward the socioeconomic benefits of mushroom production (Singh, 2000). Tufa, Bekele and Zemedu (2014) conclude that education improves farmers' ability to gather and analyze relevant market information, which improves farmers' managerial ability in terms of better formulation and execution of farm plans, as well as acquiring better information to improve marketing performance. The number of years mushroom farmers have been formally educated was used to capture education for this study. It is assumed that the number of years of formal education has a positive effect on the level of sales of mushroom farmers.

Labour is significant in agriculture in general and mushroom production in particular. Its significance can be inferred from the perspective of Mabuza et

al. (2013) that households having a relatively larger labour size (endowment) also have a greater likelihood of making a higher labour contribution towards the mushroom enterprise which, all other things being equal, should result in higher production capacity and the volume or value of mushroom sold. In this study, household labor endowment was measured in man-equivalents according to Langyintuo and Mungoma (2008).

The source of information is an important contributor to effective farming, and the effectiveness of any new information on any new subject to farmers is heavily dependent on the source. If recipients of the information trust the source of information, recipients of such information are highly likely to develop positive perceptions to enhance their farming activities (Adegbola and Gardebroek, 2007).

Training is expected to reduce farmers' perceptions of the complexity of innovation while also improving the observability and adaptability of the innovation to their environment (Foster & Rosenzweig, 1995).

2.8.2.2 New technologies

New technologies are considered the most important determinant of commercialisation. Sometimes, the adoption of new technology is in itself considered commercialization (Workineh & Roth, 2006). When farmers use inputs that increase productivity, commercialisation is enhanced. According to von Braun and Kennedy (1994), smallholder farmers' use of technology results in less-risky commercialisation, and the use of technologies and innovations that increase yield and maximise resource use are key in the process of commercialisation (von Braun, Bouis & Kennedy 1994). The authors argue

further that although the impact of agricultural technologies is less likely to be significant in the short-run commercialisation, they are inevitable in long term commercialisation due to large demand for agricultural products as a drive, which calls for the use of technological innovations to meet such demands, therefore, von Braun (1995) concludes that technology and commercialisation are inseparable.

Asfaw, Shiferaw and Simtowe (2010) note that the notion that smallholder farmers benefit from agricultural technologies and innovations is not generally held, because other scholars hold that drivers of change can spike institutional and market failures which can breed consequences. As a result, Asfaw, Shiferaw and Simtowe (2010) concluded that literature abounds to support the proposition that a household's production choices influence its production technology choice, which also impacts its degree of market integration by affecting productivity.

2.8.2.3 Institutions

Institutions are "the formal and informal rules that organise social, political and economic relations. They constitute the rules of the game" (NORTH, 1992). They consist of laws, norms, convections, rights, codes of ethics, and so on, either formal or informal that streamline the activities and behaviours of individuals in human structures. (Kherallah & Kirsten, 2001) posit that institutions affect various aspects of the economy including growth, performance and development due to the influence they have on human behaviour.

Williamson (2000) adds two dimensions to institutions namely, environment and arrangement. He defines institutional environment as the fundamental political, social and legal rules that interplay to establish the basis for production, exchange and distribution. The institutional arrangement, he explains, is the interplay between economic units which spell out how the individual units can interact. Examples of the institutional arrangement, according to Williamson, are contracts, auctions, exchanges and cooperatives. Glover (1994), as cited in (Jaleta *et al*., 2009) notes that agricultural commercialisation benefits from the distributional function of institutional arrangement through access to commercialisation opportunities and sharing of risks involved in the commercialisation process.

2.8.2.4 Risks

The impact of risk on the smallholder commercialisation process is seen in the decision-making process of the household (Finkelshtain & Chalfant, 1991). Jaleta et al. (2009) citing von Braun et al. (1994) indicate that during imperfect market conditions, households that fear taking calculated risk focus on producing market-risky products on a subsistence basis for home consumption. The authors go on to say that changes in household consumption as a result of shocks are dependent on several factors, including the volume of risky crops consumed by the household, the income elasticity of demand for the risky crop, the household's risk preference, and the covariance between risky crop consumption prices and the income they generate.

2.8.2.5 Transaction costs

Increased transaction costs associated with household production as in the case of fixed costs especially, which is fixed, specific to the household or the commodity and invariable regardless of the transaction volume, shy farmers away from market participation. Not only does transaction cost impact directly on the household commercialisation by deterring smallholder households from participating in the market, but its prevalence also limits the chances of smallholder households involving themselves in the production of cash crops. This happens when the higher prevailing transaction cost discourages smallholder farmers from cash crop production and forces them to resort to subsistence food production (Govereh & Jayne, 2003; Key et al., 2000; Pingali et al., 2005). The implication of higher transaction cost on smallholder agricultural commercialisation is that household resources that could have otherwise been channelled into cash crop production for higher household income are instead concentrated into subsistence production which discourages agricultural commercialisation.

2.8.2.6 Asset holdings

The relevance of asset holdings in the smallholder agricultural commercialization process is that they serve as a buffer for unforeseen shocks which may arise in the commercialisation process. For example, when yields or prices for produce become unfavourable and affect the household income, households can liquidate their assets to cater for the mishaps in household consumption. Additionally, household assets such as land, oxen, farm

implements, machinery, human capital and so on help farm households to produce marketable cash crops (Nwafor & van der Westhuizen, 2020).

In support of the importance of asset holdings in the process of smallholder agricultural commercialisation, Sadoulet and de Janvry (1995) point out that in the advent of an imperfect factor market, owning resources becomes very crucial for efficiency. World Bank (2007) adds that education, experience and skills as a human capital asset of households enhance smallholder agricultural commercialisation.

2.8.2.7 Government Policies

Agricultural commercialisation cannot do away with supportive public policies (Pingali & Rosegrant, 1995). Commercialization of smallholder farming, according to von Braun et al. (1994), is dependent not only on the market, but also on appropriate government institutions investing in priority areas such as market development, transportation, communication, and infrastructure development, research and extension, land and property rights, capital markets, market information, credit, health, sanitation, and nutrition for rural households.

2.8.2.8 Consumer awareness

Consumer awareness is predicted to have a beneficial impact on consumer demand and purchasing behaviour. This is expected to increase product sales volume. For example, Buerke, Straatmann, Lin-Hi and Müller (2017) revealed that consumer awareness and value orientation that prioritizes sustainability have been demonstrated to have a direct positive impact on responsible consumer behaviour. This indicates that when customers are aware

of a product's value, they are more likely to demand or purchase more of it. However, this is not always the case, as Azzari and Pelissari (2021) discovered that brand awareness had no direct impact on purchase intent, contrary to popular belief (Buerke et al., 2017). According to Azzari and Pelissari (2021), consumers' knowledge of a brand or product is not enough to generate their purchase intent.

2.9 Benefits of Agricultural Commercialization

According to Leavy et al. (2008), agricultural commercialisation has various gains. First, commercialisation increases income and fosters rural growth by boosting employment opportunities, maximizing rural agricultural productivity, earning direct cash income for employees and employers, increasing the supply of food, and improving nutrition.

Commercialization, according to Govereh et al. (1999), reslts in an increase in productivity and income. Also, the common assumption underlying comparative advantage is that farmers produce primarily high-value cash crops that earns them high returns on land and labour, and then use the cash earned from cash crop sales to purchase items for household consumption.

Additionally, Timmer (1997), cited in Bernard and Spielman, (2009), states that commercialization of smallholder agriculture leads to higher productivity, greater specialization and higher incomes. Further, the ripple effects of the aforementioned benefits include improved food security, reduced poverty and general growth in the economy (Timmer, 1997 and Fafchamps, 2005) cited in (Bernard & Spielman, 2008:1).

2.10 Psychosocial factors that affect mushroom commercialization

Psychosocial factors are factors relating to the social environment of an in individual as well as the individual's thoughts and behaviour that influence his or her action (Gifford & Nilsson, 2014). These factors, according to Barney, (1973), influence commercial mushroom production and can serve as either motivation or inhibition to the commercialisation.

2.10.1 Motivation

Motivation is defined as the process by which goal-oriented behaviours are initiated, guided, and maintained. It is what motivates you to take action (Nevid, 2012). According to Tranquillo and Stecker (2016), motivation comprises the biological, emotional, social, and cognitive forces that drive behaviour, and the term is frequently used in everyday speech to describe why someone does something, thus, the impetus for human behaviour. Ryan and Deci (2000) categorises motivation into intrinsic or extrinsic motivations. Intrinsic motivation represents the interest and satisfaction that one can derive from activities, whereas extrinsic motivation represents the outcomes and rewards that are separated from the core activities, and characterised by external control and coercion.

Watt and Richardson (2007) posit that motivations influence producers to become farmers in the first place while Mellon-Bedi, Descheemaeker, Hundie-Kotu, Frimpong and Groot (2020) discovered that farmers' desire to achieve their future goals, that is, to adopt agricultural technology can be inhibited by several factors including lack of resources, policies and regulation, low returns on investment, climatic condition, risk and uncertainty., whereas

Obiadi et al. (2020) revealed that farmers' decisions to participate in the market are influenced by institutional factors such as the influence of tradition and cultural practices, the legal environment (laws governing the sale of agricultural products), the land tenure system, government organizational support, market information availability, and the use of grades and standards in agricultural marketing, which are either external/extrinsic or internal/intrinsic motivation.

Furthermore, Schunko et al. (2019) conceptualised that commercialisaion of wild non-timber products can be influenced by factors external to the farmers such as land use and management, local knowledge and attitude, demand, certification and labeling, support measures, types of the value chain, access to resources, climate, food safety measures, access to resources; and internal to the farmers such as socioeconomic and sociodemographic characteristics such as income and labour. Additionally, farmers' skill and value they place on a commodity can also influence their decision-making behaviour to produce and commercialise such agricultural commodities.

2.11 Analytical tools

This section describes in detail the analytical tools employed to analyse the objectives of the study.

2.11.1 Measuring agricultural commercialisation

Agricultural commercialisation has no common measurement. However, in literature, scholars have measured the degree of commercialisation based on the situation being dealt with (Jaleta et al., 2009) and as result, different approaches have been used for this purpose. Below are some of the measures of agricultural commercialisation:

2.11.1.1 Household/Crop Commercialisation Index

In their effort to measure household commercialisation, Strasberg, Jayne, Yamano, Nyoro, Karanja and Strauss (1999) and Govereh et al. (1999) developed the Household Commercialisation Index (HCI), also known as Crop Commercialisation Index (CCI). This index is expressed as "the ratio of the gross value of crop sales by household i in year j to the gross value of all crops produced by the same household i in the same year j expressed as a percentage as:"

$$HCI_i = \left[\frac{Gross\ value\ of\ crop\ sale_{hhiyearj}}{Gross\ value\ of\ all\ crop\ production_{hhiyearj}}\right] * 100 \quad (1)$$

Although the index was originally developed for measuring households or smallholder farmers producing more than one crop, Poulton (2018) indicates that it is also suitable for measuring the commercialisation of a single crop produced by a smallholder farmer, as it reveals the marketing behaviour of the farmer with regards to that crop. Therefore, in this study, the HCI is the ratio of the gross value of mushroom sales by a mushroom producer i in year j to the gross value of the total mushroom produced by the same producer i in the same year j, expressed as a percentage. Randolph (1993) points out that an output measure can capture a household's revealed marketing behaviour and is relatively easier to collect, while it also lends itself well to an empirical test within a regression framework.

Randolph (1993) further indicates that the main advantage of measuring agricultural commercialization on the output side is that it allows one to go beyond the traditional dichotomies of sellers versus non-sellers, or staple versus

cash crop producers. It also adds another dimension by estimating how much of their harvest households choose to sell, while still being relatively easy to compute. In addition, Carletto, Corral and Guelfi (2017) stated that this metric represents the process of agricultural commercialisation on a scale ranging from pure subsistence (H/CCIi = 0) to full commercialisation (H/CCIi = 100).

Although many researchers have used HCI in measuring smallholder agricultural commercialisation from an output perspective (Agwu, Anyanwu and Mendie, 2013; Carletto et al., 2017; Martey et al., 2012; Strasberg et al., 1999), one criticism levelled against the H/CCI as a measure of commercialisation is that the H/CCI value can mislead, because if a farmer cultivates just a single kilo of say mushroom and sells all (HCI = 100), he or she would be regarded as highly commercialised as opposed to the farmer who cultivates 50 kg and sells 30 (HCI = 60) (Gebreselassie & Sharp 2008).

2.11.1.2 Volume/value of production sold

According to Poulton (2018), agricultural commercialisation can be measured as the "volume/value of production sold." Increases in this indicator within a given farm population over time can be a reliable commercialisation indicator which can be interpreted as an improvement in farmers' market participation (degree of commercialisation). It is less data-demanding than the HCI/CC1 and less susceptible to the issue of distress sales (Poulton). When value or volume of production sold is used as an indicator for the degree of commercialisation of a single crop, Seyoum et al. (2011) indicate that all the farmers must produce that crop both for consumption and for sale. In other words, all the smallholder farmers must sell at least some of their outputs.

The researcher measured the degree of mushroom commercialisation in this study based on the farmers' activities in the 12 months preceding the survey. The researcher considered all mushrooms sold by the producer during that period since all the smallholder mushroom producers in the study sold at least some of their harvest. This allowed the researcher to calculate the degree of commercialisation—rather than simply identifying commercialised and non-commercialised producers—as the monetary value of the volume of mushrooms sold during the last 12 months before the survey period (Saha et al, 2021) to determine the degree of mushroom. The researcher also computed the intensity of mushroom commercialization using the household/crop commercialisation index (H/CCI) to indicate the extent to which mushroom production is oriented towards the market (Leavy et al., 2008b; Poulton, 2018; Qaim et al., 2020), with much focus on the amount of mushroom sold.

However, the degree and intensity of commercialisation could not be calculated in the absence of an average price. As a result, the researcher imputed price data for each farmer identified in the data. Because the researcher discovered that smallholder mushroom farmers frequently sold at different prices, he corrected for any outliers concerning the imputed prices by using the local average price per kg of mushroom (Saha et al., 2021). Because the H/CCI would identify the proportion of sales from harvests without distinguishing between households that sell say, GHC100 and those that sell GHC10,000.00 to account for differences in such numbers, the volume of sales made by mushroom producers was used as the key commercialisation indicator in this

study (Baisa, 2009b; Gebreselassie & Sharp, 2007; Omiti et al., 2009a; Qaim et al., 2020; Saha et al., 2021).

2.11.2 Principal component analysis (PCA)

Principal Component Analysis (PCA) technique, developed and described by Pearson (1901) and Hotelling (1933) (Jolliffe, 2002), was used to extract the factors that can most motivate or impede mushroom commercialization. PCA is a method for reducing the dimensionality of a huge dataset while also improving the interpretability of the new data (factors) created and minimizing information loss (Jolliffe & Cadima, 2016). PCA is based on the covariance or correlation matrix eigenanalysis. Each variable has a loading that indicates how well the model components take that variable into account. They show how much each variable contributes to the significant variation in the data and how variables are related (Balabanova, Stafilov & Baceva, 2015).

Jolliffe and Cadima (2016) explain that the PCA's function of conserving as much variety as feasible results in the discovery of new variables that are linear functions of those in the original dataset, that sequentially maximize variance, and are unrelated with one another. PCA's primary applications are descriptive rather than inferential, according to Jolliffe and Cadima (2016), and unlike inferential analytical purposes, where a multivariate normal (Gaussian) distribution of the dataset is typically assumed, PCA is a descriptive tool that does not require distributional assumptions and, as such, is a very adaptable exploratory method that can be used on numerical data of various types.

PCA uses an orthogonal transformation to turn several correlated observable variables into a smaller number of linearly uncorrelated variables known as principal components or factors (Masnan, Zakaria, Shakaff, Mahat, Hamid, Subari & Saleh, 2012). As long as the subsequent component is orthogonal to the preceding component, the first principal component accounts for the largest variation in data, and the subsequent component has the next largest variance. The number of original features, p, is reduced to a few unobserved variables, k, which are referred to as principal components. The highest variance is accounted for by the principal components (k), such that $k \leq p$ (Paul, Suman & Sultan, 2013). Original features p represents the original number of observed variables for each of the cases (1–n) before the transformation. An example of original data with n objects and p observed variables is presented in Table 1.

Table 1: Form of data for Principal component analysis with n cases each with p features.

Case	X_1	.	Xp
1	$X11$	.	$X1p$
2	$X21$	.	$X2p$
.	.	.	.
.	.	.	.
n	$Xn1$	.	Xnp
n	$Xn1$	.	Xnp

Source: Paul, Suman and Sultan (2013).

The principal components ($Z_1, Z_2, \ldots, Z_i$) are generated through a linear combination of variables $X's$.

$$Z = {}_{\alpha}{}^{T}X(1)$$

where; $Z = Z_1, Z_2, Z_p$—vector of principal components; α^T-matrix of coefficients α_{ij} for $i, j = 1, 2, \ldots, p$

$$Z_1 = \alpha 11X_1 + \alpha 12X_2 + \ldots + \alpha 1pXp \quad (2)$$

Z_1 is the largest combination of p features under the condition that

$$\alpha 112 + \alpha 212 + \ldots + \alpha 21p = 1 \quad (3)$$

The second principal component Z_2 has the second-largest possible variance in $X_1, X_2, \ldots, X_p$, which is orthogonal and uncorrelated with Z_1. The j^{th} principal component with the largest possible variance is defined similarly, provided it is uncorrelated with the i^{th} principal component for $i < j$. The principal components obtained are in decreasing order, i.e., variance (Z_1) > variance (Z_2) > . . . > variance (Z_p). If λ_i is the variance (eigenvalue) for Z_i and α_{ij} is the eigenvector for Z_i then the following conditions hold:

$$\lambda_1 \geq \lambda 2 \geq \lambda_i \geq 0 \quad (4)$$

$$\alpha_1^T \alpha_i = 1 \quad (5)$$

$$\alpha_1^T \alpha_h = 0 \quad (6)$$

The eigenvalue denotes the amount of variance induced by the principal component. For k-retained principal components, the variance for the principal component is calculated by

$$t_k \quad \underline{\quad}^{i} = \frac{\sum_{i=1}^{k} \lambda}{\sum_{i=1}^{p} \lambda} \quad (7)$$

Covariance or correlation matrices can be used to extract principal components. When the variables do not have gross variance, a covariance matrix is used. Before applying a covariance matrix with such data, it is necessary to standardize the data. The correlation matrix, on the other hand, is

used to analyze data that has a large variation (Masnan et al., 2012). According to Paul et al., (2013), the researcher selects the suitable transformation matrix based on the data structure. Only principal components with eigenvalues greater than 1 are kept when using the correlation matrix. When the covariance matrix is employed, principal components with eigenvalues greater than the average of total eigenvalues are maintained.

For the PCA results to be meaningful and interpretable, the variables under consideration must have a high correlation with one another. To achieve this, the variables defined for the analysis must be correlated with one another using Pearson's correlation before the PCA can be performed (Sharma, 1996). To assess the unidimensionality of variables using PCA, the analysis is performed with varimax rotation, and variables with eigenvalues greater than one are extracted, as are all variables with factor loading greater than 0.5 (Tabachnick & Fidell, 2001) or greater than 0.4 (Hair, Black, Babin & Anderson, 2014). The Kaiser – Meyer – Olkin Measure of Sampling Adequacy (KMO-MSA) is used to test the appropriateness of the factor analysis for the scale, and all values greater than or equal to 0.5 are accepted (Nugrahadi, Maipita & Situmeang, 2020). Furthermore, a Cronbach alpha coefficient reliability test and mean inter-item correlation value (MIC) were used to purify the measurement scale for each construct. Cronbach alpha coefficient cut-off point above 0.5 and MIC of 0.15 and above are also used to accept the measurement scale (Bosscher & Smit, 1998; Hair et al., 2014; Pallant, 2013).

In this study, factors were derived from the item listings under “Motivating factors” and “inhibiting factors” using principal components

analysis (PCA). Components represent groups of variables that are highly correlated as a new single variable. In doing so, PCA identifies underlying structures or latent variables using combinations of indicator variables (StatSoft, 2001) as cited in (Greiner & Gregg, 2011). It investigates the structure of the data set, to identify the procedures controlling the scores of the variables in the data. PCA produces several linear combinations of observed variables (motivating and inhibiting factors), each linear combination being a component or factor (Bao & DUAN Fei-zhou, 2006). The components summarize the patterns of the correlations in the observed correlation matrix and can be used to reproduce the observed correlation matrix. In this application of PCA, the variance contribution of each factor component was extracted using orthogonal axis rotation (Greiner & Gregg, 2011).

2.11.3 Garrett's ranking method

One appropriate method for analysing contributions is the Garrett method proposed by Garrett and Woolworth in 1969. This method helped to identify the most important contributions of FRI that benefited the mushroom prodcers onto commercialisation. To use this method of analysis, several factors are presented to the respondents to rank them according to how important they regard the factors in the order of merit. The order of merits given to the factors by the respondents are converted into ranks by the use of the Garrett formula below:

Percent position = 100 (Rij – 0.5)/Nj

Where Rij = Rank given for the ith variable by jth respondents

Nj = Number of variables ranked by jth respondents

Using Garrett's Table, the estimated percent position is converted into scores after which each individual's scores for each factor are summed up. The total value of scores and mean values of the score are then calculated. The factors having the highest mean value are considered to be the most important factors (Dhanavandan, 2016). That is, the mean scores are used to determine the factor that is of higher importance or more prevalent. The underlying assumption is that the factors with the highest mean value are regarded as being the most important factor to the respondents. The Garrett technique takes into consideration the heterogeneity of groups, and it also has a built-in test of agreement that calculates the mean scores for respondents who rank the particular factor. This implies that all respondents are given an equal chance to identify and rank all the factors presented to them and therefore, the final mean score represents the collective view of the whole sample (Abu, 2015). Based on the literature reviewed and the nature of this study, the Garrett ranking method is chosen to analyse and rank the contributions of the various services CSIR-FRI provides to the MUGREAG to know which service (s) most affect mushroom commercialization.

2.11.4 Ordinary Least Squares (OLS) multiple linear regression

OLS multiple regression is a linear multiple regression that assesses the influence of independent variables on a dependent variable. The OLS regression analytical tool is applied in studies where the dependent variable is continuous and is measured on a ratio or an interval level (Cohen, West & Aiken, 2014). The OLS regression uses more than one independent variables to estimate the dependent variable while determining the quantum of effects these independent

variables have on the dependent variable (Hutcheson, 2011). According to Williams, Grajales and Kurkiewicz (2013), to run an OLS regression, the dependent variable must be a continuous variable; the independent variables should be two or more; the data should conform to normal distribution; the data should be devoid of autocorrelation and multicollinearity; and the data should be homoscedastic and parametric.

2.12 Theoretical framework

The study is underpinned by two theories namely, The Trade theory and Vroom's expectancy theory.

2.12.1 Trade theory

The theoretical underpinnings explaining the reasons for farmer households' choice to commercialise (participate in the agricultural market) is enshrined in David Ricardo's trade theory. The trade theory of Ricardo maintains that farmers produce goods for which they have a comparative advantage and then exchange these goods for those goods for which they have a lower comparative advantage (Siziba et al., 2011). However, the trade theory is unable to identify the specific determinants of agricultural commercialization, which gave rise to numerous theoretical models. One of such models is the non-separable household agricultural commercialisation behaviour model postulated by Barret (2008) (Barrett, 2008; Boughton et al., 2011). The non-separable household agricultural commercialisation behaviour model assumes that a farm household must choose between being a buyer, net seller, or autarchic to maximize utility, and is represented in reduced form as a function of the exogenous variables: A, G, W, P, Z, which represent private asset stock, public

asset stock, household-specific characteristics, commodity price, and transaction costs, (Abu, 2009). That is, a farm household's comparative advantage to produce and commercialise a particular agricultural commodity is influenced by these factors, with profit maximization as the goal.

This study considers commercialization as farmers' participation in the crop (mushroom) output market as sellers. The degree of commercialization (that is, the amount of products sold on the market) is influenced by several household characteristics, farm-related characteristics, market-related and public assets factors (Baisa, 2009). Therefore, to achieve the last objective of the study, which determined the factors that predict the degree of commercialisation by the small-scale mushroom producers, the researcher employed the Ordinary Least Square estimation (OLS) to determine the cause-and-effect relationship between the dependent variable, degree of commercialization, and the explanatory variables, following (Baisa, 2009).

The OLS regression functional relationship between the dependent and independent variables is given by:

$$Y = ß_0 + ß_1X_1 + ß_2X_2 + \ldots\ldots + ß_nX_n + Ɛ, \quad (1)$$

where

$ß_0$ = a constant, the value of Y when X values are zero

$ß_i$ = the slope of the regression surface (The ß represents the regression coefficient associated with each X_i.

Ɛ = an error term, normally distributed about a mean of 0 (for purposes of computation the Ɛ is assumed to be zero).

2.12.2 The Vroom's expectancy theory

Vroom's expectancy theory, also known as Valance-Instrumentality-Expectancy (VIE) theory, propounded by Victor Vroom in 1964, considers the process of motivation as a force influenced by three factors multiplicatively combined. The theory posits that people's willingness to perform in a particular manner is determined by their level of expectation that a clearly defined result will follow the performance and the attractiveness of such result to the individual. The expectancy theory postulates that employee motivation is determined by the degree to which each employee wants to be rewarded (Valence), the judgment that effort is likely to yield desired performance (expectancy), and the belief that the performance will result in a reward (belief) (Instrumentality). As a result, valance refers to how much weight a person places on a predicted outcome. It is the expected, not the actual, satisfaction that a person expects to feel after attaining their objectives. The value that an individual places on a reward is referred to as valance. The strong idea that better efforts will result in higher performance is known as expectancy (Obiadi et al., 2020).

The VIE theory postulates that there are cause-and-effect relationships between the motivational process and the levels of expended efforts, achieved performances and allocated awards (Vroom, 1964). Individuals have various goals, and they can be driven to achieve these goals if they believe that: The link between effort and performance is positive (Lawler & Porter, 2009). Motivation and other socio-psychological factors are thought to have a significant impact on human behaviour and performance (Pannell, Marshall,

Barr, Curtis, Vanclay & Wilkinson, 2006). Farmers' commercialisation decisions may be influenced by motivations that represent long-term aims and aspirations (Farmar-Bowers & Lane, 2009). Similarly, farmers are motivated to become farmers in the first place for the same reasons (Watt and Richardson, 2007). Furthermore, according to Ryan and Deci (2000), motivation is generally classified as intrinsic or extrinsic. Intrinsic motivation is concerned with the interest and satisfaction derived from an activity, while extrinsic motivation is focused on outcomes and rewards that are independent of the core activity, and is characterized by external control and coercion (Prager & Posthumus, 2010). Intrinsic motivation may increase the likelihood of commercializing agricultural production.

This theory has been applied in the study of agricultural commercialization by scholars such as Obiadi et al. (2020) who investigated the effect of institutional and technical factors in the marketing of agricultural products by Cooperative Farmers in Nigeria. This theory was used in this study to investigate the motives and barriers to mushroom commercialization among small-scale mushroom farmers. It is consequently envisaged that mushroom commercialization will result in an increase in farm income and that the presence or absence of certain factors such as institutional factors and technical factors can motivate or inhibit farmers' engagement in mushroom commercialization.

2.13 Conceptual framework

The main indicator of commercialisation used in this study is farmers selling their produce. Mushroom farmers' degree of mushroom commercialisa

tion is influenced by their commercialisation behaviour as well as their extrinsic and intrinsic motivations, as shown in Figure 1. First, before farmers will produce any agricultural product and sell it, they consider their comparative advantage for producing such product. These comparative advantages, according to the Barrett's Household's non-separable Agricultural Commercialisation behaviour model, include farmers' socioeconomic and socio-economic characteristics such as income level, land available, inputs (availability, quality), demand and available market for the product, level of education, household size, marital status, age, access to extension, price, access to extension service, reliable sources of raw materials, years of producing mushrooms, output price, modern technologies, and so on, which constitute the private and public asset stocks, transaction cost, farmer-related and socioeconomic characteristics. These characteristics, according to Barrett (2008), influence farmers' decisions to commercialise their mushroom production and have a direct effect on the degree of (mushroom) commercialisation.

Motivation and other socio-psychological factors have a significant impact on human behaviour and performance (Pannell, Marshall, Barr, Curtis, Vanclay & Wilkinson, 2006). Farmers' commercialisation decisions are influenced by motivations that represent long-term aims and aspirations (Farmar-Bowers & Lane, 2009). Similarly, farmers are motivated to become farmers in the first place for the same reasons (Watt and Richardson, 2007). Furthermore, according to Ryan and Deci (2000), motivation is generally classified as intrinsic or extrinsic. Intrinsic motivation is concerned with the

interest and satisfaction (personal judgment or value placed on the commodity) derived from an activity, while extrinsic motivation is focused on outcomes and rewards that are independent of the core activity, and is characterized by external control and coercion (Prager & Posthumus, 2010). These motivations can directly and indirectly impact the degree of commercialisation (Obiadi et al., 2020). Furthermore, agricultural commercial commercialization can thrive well when there is a leading agent, being it private or public institution (CSIR-FRI) or both (extrinsic motivation) that play mediating roles (Pingali & Rosegrant, 1995) which also serve as an external motivation for mushroom commercialsation (Mellon-Bedi et al., 2020).

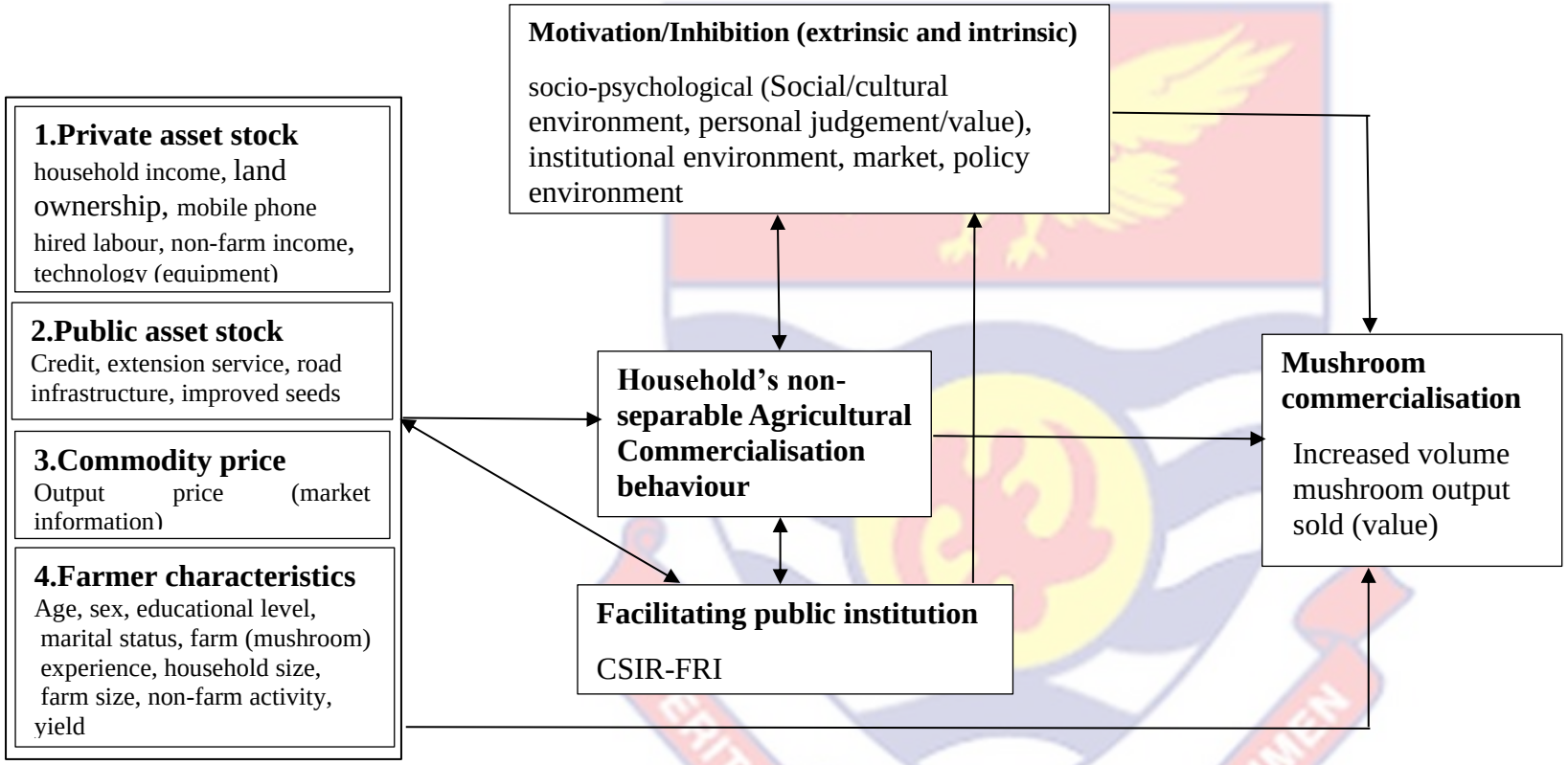

Figure 1: Conceptual framework for Determinants of mushroom commercialization

Source: Author's construct.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter describes the methodology and procedures used to carry out the study to arrive at the results.

3.2 Study Area

The study was conducted in two municipalities in the Greater Accra region of Ghana: Ga East and Adenta. The Ga East Municipality is located in the northern part of the region, with Abokobi as its capital. The Ga West Municipal borders it on the west, the La - Kwantanang Municipal on the east, the Accra Metropolitan on the south, and the Akwapim South District on the north. It has a population of 147,742, accounting for 3.6 percent of the region's overall population. Females make up the majority of the population (51 percent), with males accounting for the remaining (49 percent). Rural areas are home to over 90% of the population. The Municipality has an approximate land size of 85.7 square kilometers. Services and sales account for 35.1 percent of the population's employment, accounting for 92.1 percent of those employed. Craft and associated trades account for 22.6 percent of total employment in the town, following services and sales. Agriculture is practiced by only about 5.5 percent of households, with the majority of these homes (6.4 percent) located in rural areas and 5.4 percent in urban areas. Crop production is the most common type of agricultural activity (80.2 percent of the households). The municipality is located in the savannah ecozone. The average yearly temperature varies

between 25.1oC in August and 28.4°C in February and March, indicating a bimodal rainfall pattern. The hottest months are usually February and March.

The Adentan Municipality is located 10 kilometers northeast of Accra, at latitude 5° 43 north and longitude 0° 09 west. The Municipality covers an area of 928.4 square kilometers and is bordered on the east and north by Ashaiman Municipal Assembly and Kpong Akatamanso District Assembly, and on the west and south by La Nkwantanang Municipal Assembly. The Municipality has a population of 78,215 people, with males accounting for 50.3 percent and females for 49.7%. 62.5 percent of the population lives in cities, while 37.5 percent lives in rural areas. With a total of 20,478 households, the Municipality has a household population of 76,601, with an average household size being 3.7 people. Around 74.1 percent of the population, aged 15 and over is employed, compared to 25.9% who are not. About 91.2 percent of the working-age population is employed, while 8.8% are unemployed. In the Adentan Municipality, agriculture is only done by 7.1 percent of families. Agriculture is practiced by more households in urban areas (938) than it is in rural areas (515). The majority of agricultural households in the municipality engage in crop cultivation (88.9 percent).

Chickens and goats are the most prevalent animals raised in the municipality. Throughout the year, temperatures are normally high. The hottest months are March to April, with highs of 32°C during the day and 27°C at night and the coolest months are May to September, with highs of 27-29°C during the day and 22-24°C at night. There are two rainy seasons in the municipality. April to July is the first and main season, while September to November is the second

and lesser season. Residents may produce and harvest various kinds of crops in most months (8 months) of the year due to the bi-modal rainfall pattern, which provides a suitable climate for farming activities.

Greater Accra was selected for the study because it is the origin of the mushroom commercialisation campaign in Ghana. It also harbours the headquarters of the MUGREAG which has a substantial number of mushroom farmers. The two municipalities were also chosen because they harbour the majority of the registered mushroom producers in the region and also, they have been the location for most mushroom training programmes. Moreover, the mushroom farmers in these areas are small-scale farmers.

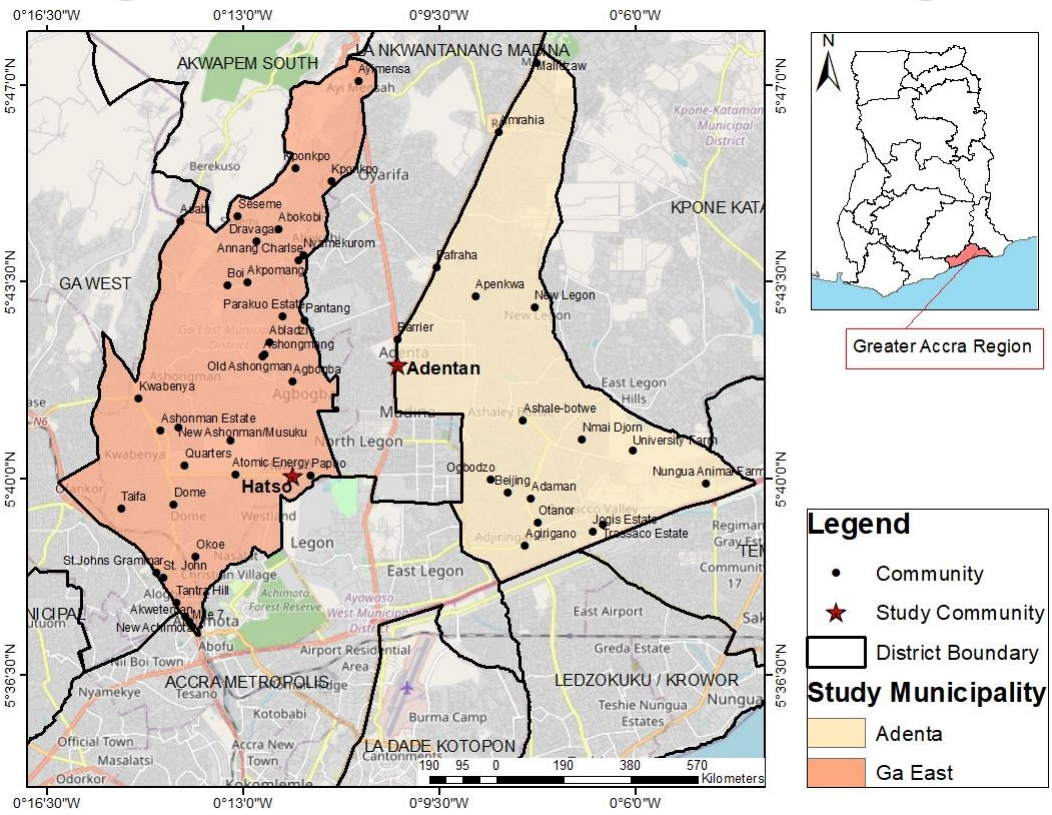

Figure 2: The study area's map

Source: Department of Geography and Regional Planning, University of Cape Coast (2021)

3.3 Research design

The study used a cross-sectional survey methodology and a quantitative research approach based on positivist research philosophy. Positivism uses the hypothetico-deductive technique to verify a priori hypotheses where functional links between independent variables and outvomes can be inferred (Ponterotto, 2005). This philosophy enables hypotheses like socio-economic and demographic background of mushroom producers and the psychosocial factors that influence the degree of mushroom commercialisation to be tested to determine the relationship between them.

Quantitative research involves collecting numerical data and analysing it using mathematically based methodologies to explain events (Muijs, 2010). Surveys, generally, gather data at a particular point in time to describe the nature of existing conditions, identify standards against which existing conditions can be compared, or determine the relationships that exist between specific events (Cohen et al., 2007). Cross-sectional studies, according to Levin (2006), give a snapshot of the outcome and the factors associated with it at a specific point in time. To address research objectives under the cross-sectional survey design, data are collected on a population or a sample of the population at only one point in time (Portier et al., 2000). The cross-sectional survey was chosen for this study because it permits data on mushroom producers to be collected and analyzed just at the time of the study, without finding any cause-and-effect relationships between populations throughout time.

3.4 Population of the study

The study's population is comprised of all mushroom producers who produce and sell mushrooms in the two municipalities in the Greater Accra Region of Ghana and are registered with MUGREAG--Greater Accra chapter. Specifically, the size of the study's population was 210 mushroom producers in the Ga East and the Adenta municipalities who were registered with MUGREAG-Greater Accra Chapter and drawn from mainly from Adenta and Haatso in Greater Accra.

Because the population was small in size (210), a census of the mushroom farmers was taken. Census, according to Lavrakas (2008), is the listing of all elements in a group and measuring the desired characteristics of those elements. Census allows the researcher to collect information on all eligible elements in a defined population. Using census, all the mushroom producers registered with MUGREAG in the selected municipalities were considered as respondents for the study.

Table 2:Population of the study

Municipality/District	The population of mushroom producers
Adenta	135
Ga East	75
Total	210
Assessed	179
Final	153

Source: MUGREAG records

The difference between the total population, the accessed population and the final population is a result of the non-availability of some mushroom producers during the data collection period, and also as a result of data cleaning.

3.5 Data collection instrument

The data for the study was collected using a content-validated structured interview schedule. The researcher, the supervisor, and the Head of the Mushroom Unit at CSIR-FRI, all ensured the instrument's face and content validity. Face validity was achieved by wording the instrument with basic, easy-to-understand phrases that communicated the instrument's purpose. The supervisor validated the instrument's content validity by carefully inspecting the content of the instrument in relation to the research questions and objectives to ensure that it accurately reflected the objectives and research questions. The Head of the CSIR- FRI's Mushroom Unit assessed the appropriateness of the items measuring the CSIR-FRI's contribution to mushroom commercialization (in SECTION E of the instrument) to determine whether the services stated on the instrument were provided by the CSIR- FRI's Mushroom Unit (Salkind, 2010). The structured interview schedule was made up of five (5) sections below:

Section A: Household demographic/socio-economic characteristics

Section B: Infrastructure and marketing information

Section C: Motivating factors of commercialisation of mushroom Production.

Section D: Inhibiting factors (constraints) of commercialisation of mushroom production.

Section E: contributions of Food Research Institute towards mushroom Commercialisaton.

The items in Sections A and B were measured using open-ended, close-ended, and partially close-ended items. The items in Sections C and D were measured on a unidimensional, five-point Likert-type scale ranging from 1 to 5, with 1 denoting "least level of agreement" and 5 denoting "highest level of agreement." Section E items were scored from high benefit to least benefit, with 1 signifying the high benefit.

Table 3: Summary of Likert-type scales and their respective interpretations on the instrument

Ratings	Interval	Level of Agreement
5	4.45-5.00	Very High Agreement
4	3.45-4.44	High Agreement
3	2.45-3.44	Moderate Agreement
2	1.45-2.44	Low Agreement
1	1.00-1.44	Very Low Agreement

Author's construct (2021).

3.6 Pretesting of research instrument

The instrument for the study was pre-tested in the Accra Metropolitan District (AMD) in the Greater Accra region from April 2nd to April 15th, 2021. Twenty-two (22) mushroom producers from "37" and Achimota in AMD were selected for the pretest. According to Carmines and Zeller (1979), pretesting of a research instrument helps to ascertain the degree of reliability of the research instrument to ensure that the findings would be the same when the study is repeated by other researchers. Importantly, the pre-test enables the researcher to finetune the items in the research instrument, especially the Likert-type scales

used in the instrument. Kankam (2010) has identified three key objectives of pretesting: a) to ensure the suitability of the research instrument, b) for the researcher to obtain clarity of the items included in the instrument, and c) to ensure that the researcher follows all administrative protocols relevant to research.

According to Taherdoost (2016), the reliability of research instruments is usually done to achieve two aims. First, reliability enables the researcher to determine the external reliability of the instrument and second, the internal reliability of the instrument. In most studies, scholars use the Cronbach alpha to estimate the internal reliability of the research instrument (Taber, 2018).

The researcher interviewed the selected mushroom producers using the research instrument. The pretesting was done in the last week of May 2021. The internal consistency of the items on all Likert-type scales in the study instrument was determined using the Cronbach's Alpha reliability, which was computed using the Statistical Package for Social Sciences (SPSS) version 25 (Nunnally, 1978). The goal was to see if the Likert scale items all had the same underlying construct.

The results revealed a Cronbach alpha coefficient which ranges from 0.73 to 0.81 (Table 4). According to Gliem and Gliem (2003), for a descriptive study, a strong coefficient value is required, because, the higher the Cronbach's Alpha coefficient, the better the scale's internal consistency. This means that internal consistency is dependent on the Cronbach alpha values. Furthermore, the authors pointed out that, coefficients greater than 0.9 = Excellent, >0 .8 =

Good, >0 .7 =Acceptable, >0.6 = Questionable, > 0.5 = Poor, and a coefficient less than 0.5 = Unacceptable.

Table 4 shows the reliability coefficients of various constructs in the instrument.

Table 4: Reliability coefficients of various constructs in the instrument.

Construct	Mushroom farmers n (22)	
	Alpha	No. of items
1.Motivation for mushroom commercialization	0.81	13
2.Inhibiting factors for Mushroom Commercialization	0.73	11

Source: Field Data (2021).

The Cronbach's Alpha coefficient for the motivating and inhibiting factor scales were 0.81 and 0.73 respectively. According to Pallant (2013), a scale's Cronbach's alpha coefficient should be more than 0.7 to be perfect for measuring the construct under research. Straub, Boudreau and Gefen (2004) believe that a Cronbach alpha score of 0.6 for a pre-test is sufficient for the study instrument to be considered reliable. The Cronbach's Alpha values obtained show that the two Likert-type scales on the instrument for measuring motivating and inhibiting factors of mushroom commercialisation were reliable, based on the literature mentioned above.

After the pre-testing, certain questions were eliminated, reworded, and re-arranged in addition to the reliability analysis. Q2 in section A, for example, intended to elicit the farmers' real ages, but the question's phrasing removed "last" and "day" and instead asked the farmers to "Please identify your age at birth." After the pre-test, this question was rephrased as "Please identify your age at your most recent birthday."

In addition, Q5 in section A aimed at determining the degree of education of the farmers was not initially included on the survey instrument. It was introduced following the instrument's pre-test when it was discovered that some of the farmers were having trouble recalling their raw years they have spent in school.

Furthermore, Q9 measured the size of land used for mushroom cultivation in acres, but following the pre-test, it was discovered that land for mushroom production is measured in meter-squared by the farmers. As a result, the measuring unit was changed to meter-squared, which was then translated to acre in the analysis.

Moreover, during the pre-test, it was revealed that the numbers assigned to the CSIR-FRI contributions towards mushroom commercialisation were influencing the respondents' rating of the contributions in Q51 under section E (probably the respondents thought the contributions were pre-arranged). As a result, the researcher decided to remove the numbers from in front of the contributions so that the respondents may score them without believing they were pre-arranged.

Lastly, during the pre-test, it was determined that the word "Consumers" used in the Motivation and Inhibition scales for sessions C and D was ambiguous. As a result, the researcher and respondents agreed to use the phrase "current consumers" to reflect the current market rather than "consumers," which might refer to both current and future consumers.

3.7 Data collection procedures

To ensure successful and effective data collection for the study, the executives, especially the Chairperson of the MUGREAG-Accra Chapter, were contacted and briefed about the study and its purpose. This was done officially via an introductory letter issued by the Department of Agricultural Economics and Extension, University of Cape Coast. The contacts were made to describe the study's purpose and to solicit help with field data gathering. Mushroom producers were identified to participate in the research with the help of MUGREAG officials in Accra. The goal of the study was explained to the participants, and they were assured that their responses would be kept private.

Data collection began the second week of June 2021 and ended the last week of August 2021. The data was collected using a structured, content-validated interview schedule. The researcher collaborated with three trained enumerators to perform face-to-face interviews with 145 mushroom farmers and phone interviews with 12 mushroom farmers. Some farmers (14 in number) also requested soft copies of the study instrument, which they completed and sent same to the researcher through email and WhatsApp. The response rates for face-to-face, phone interviews and soft copies were 100%, 100% and 71% respectively, representing 145, 12 and 10 responses from the respective data

collection methods. The overall response rate from the target population was 79 percent (167 responses) at the end of the data collection, which was regarded best for analysis because it was higher than the typical response rate of 60 percent recommended as a minimum by Baruch (1999) for analysis to proceed.

3.8 Data analysis and presentation

The data gathered was organised and cleaned, leading to a valid response rate of 72% (153) to ensure that the replies matched the study questions on the instruments. The data were entered into IBM SPSS version 25.0 after creating a data template in the software program (IBM SPSS version 25.0) based on the research instrument. The first objective of the study was to describe the farmers' socio-demographic background, and this was achieved using descriptive statistics such as frequencies, percentages, averages, and standard deviation.

The second objective was to describe the state of mushroom commercialisation. This was attained using descriptive statistics such as frequencies, percentages, means, standard deviation, and the Crop Commercialisation Index (CCI) (Muijs, 2010; Poulton, 2018).

Objectives three (3) and four (4) of the study, which sought to identify the motivating and inhibiting factors of mushroom commercialisation in the study area, were analysed using principal components analysis (PCA) to explain the motivating and inhibiting factors for mushroom commercialisation in the study area. The goal of using principal component analysis was to reduce the data set on the motivations and inhibitions of mushroom commercialisation with correlated variables into a new set of uncorrelated factors. The PCA therefore is expected to produce an empirical summary of the data set on the motivating

and inhibiting factors of mushroom commercialisation in the study area (Cohen et al., 2007).

Objective five (5), which sought to determine the key contributions of CSIR-FRI towards mushroom commercialisation in the study area, was analysed using the Garrett ranking method. Using Garrett ranking, the most important services of CSIR-FRI that contribute highly to mushroom commercialisation in the study area, from the respondents' perspective, were identified. This was accomplished by presenting the identified services to the respondents and asking them to score them according to the extent they benefited from the services. Farmers benefited the most from the service with the greatest Garrett mean value and that service is adjudged the most important contribution of CSIR-FRI to mushroom commercialisation in the research area (Dhanavandan, 2016).

Finally, OLS multiple linear regression was used to analyse objective six (6), which sought to predict the factors that influence the degree of mushroom commercialisation in the study area (Muijs, 2004). Table 5 presents the objectives, level of measurement and methods for analysis.

Table 5: Specific objectives, Levels of measurement and analytical tools

OBJECTIVES	LEVEL OF MEASUREMENT	ANALYTICAL TOOLS
1. To describe the socio-demographic characteristics of the mushroom farmers in the study area.	Nominal, ratio, interval	Frequency, percentage, standard deviation.
2. To describe the state of mushroom commercialization.	Ratio	Crop Commercialisation
a. Overall output produced in the previous year (value)	Ratio	Index (CCI), frequency,
b. Total output sold in the previous year (value)		percentages, standard deviation
3. To determine the motivating (production, institutional, social, environmental, technological, marketing and economic) factors for mushroom commercialisation	Ordinal	Principal Component Analysis
4. To determine the inhibiting (production, institutional, social, environmental, technological, marketing and economic) factors of mushroom commercialization	Ordinal	Principal Component Analysis
5. To determine the key contribution of CSIR-FRI towards mushroom commercialization	Ordinal	Garrette ranking
6. To identify the factors that impact the degree of mushroom commercialization	Interval/Ratio	OLS regression

Author's construct.

3.8.1 Model estimation for the degree of mushroom commercialisation

The researcher employed the OLS linear multiple regression tool to examine how the study's independent varibles influenced the dependent variable, which is the degree of mushroom commercialisation. Because the dependent variable, the degree of commercialisation, is a continuous variable and measured on the ratio level, the OLS regression model was deemed appropriate for the estimation (Cohen, West & Aiken, 2014). The OLS regression uses a minimum of two independent variables to predict the dependent variable. It goes on to quantify the magnitude of the relationship between these variables (Hutcheson, 2011). According to Williams, Grajales and Kurkiewicz (2013), OLS multiple linear regression requires a continuous dependent variable, multiple independent variables, data that is normally distributed, free of autocorrelation and multicollinearity, homoscedastic, and most crucially parametric. For this research, the OLS multiple regression is stated as

$$Y = f(\beta, X, \varepsilon) \quad (1)$$

This is further expanded in equation (2) as

$$Yi = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_{22} X_{22} + \varepsilon i \quad (2)$$

Where

Y = degree of mushroom commercialisation.

β_0 = value of Y when X_1 through X_{22} remain constant

β_1- β_{22} = estimated regression coefficients

εi = error term

X_1 =Sex of respondents

X_2 = Age of respondents

X_3 = Marital status

X_4 = Education level

X_5 = Land ownership

X_6 = Size of Land used for producing mushroom

X_7 = Years of producing mushroom

X_8 = Annual income

X_9 = Production facility

X_{10} = Off farm activity

X_{11} = Application of irrigation

X_{12} = Access to credit

X_{13} = Member of farmer association

X_{14} = Access to extension officer

X_{15} = Average price per kg of mushroom

X_{16} = Social awareness

X_{17} = Market incentives

X_{18} = Economic value

X_{19} = Institutional constraints and personal weaknesses

X_{20} = Value chain challenge

X_{21} = Market uncertainty

X_{22} = Hired labour

Table 6: Variables for OLS Multiple regression analysis

Variable	Description	Measurement	Expected relationship with the dependent variable (Degree of mushroom commercialisation)
Age	Age in years.	Ratio	+/-
Sex	1 if the household head is male and 0 otherwise	Nominal	+/-
Marital status	1 if married and 0 if not married	Nominal	+
Farming experience	Number of years of supplying mushroom to the market	Ratio	+
Farm size	Farm size/ allocated to mushroom production in hectare (ha)	Ratio	+
Family size	Number of family members in the household	Ratio	+
Land ownership	1 if owns land and 0 if otherwise	Nominal	+
Market information	Access to market information: 1 if they have access to market information and 0 if otherwise	Nominal	+
Credit access	1 if the respondent had access to credit and 0 if otherwise	Nominal	+
Cooperatives	1 if the person is a member of cooperatives or 0 if otherwise	Nominal	+
Irrigation	Irrigation access: 1 if the respondents have access to irrigation and 0 if otherwise	Nominal	+
Hired labour	Number of people hired on the farm	Ratio	+
Educational level	Level of education attained	Ordinal	+
Non-farm activity	1 if participate in a non-farm activity, 0 if otherwise	Nominal	+
Price (Price)	Last years' price per kg of fresh mushroom in GHS	Ratio	+
Annual income	Income from last year's non-farm activities	Ratio	+
Inhibiting factors	Social, institutional and environmental factors	Interval	-
Motivating factors	Social, institutional and environmental factors	Interval	+

Source: Author's construct

CHAPTER FOUR

PRESENTATION AND DISCUSSION OF RESULTS

4.1 Overview of the chapter

The outcomes and findings of this study are presented in-depth in this section. The socio-demographic background of the producers, the state of mushroom commercialisation, the motivating and inhibiting factors to mushroom commercialisation, the key contributions of CSIR-FRI towards mushroom commercialisation and determinants of the degree of mushroom commercialisation are presented.

4.2 Socio-demographic and marketing characteristics of respondents

This section details the socio-demographic and marketing characteristics of the 153 mushroom producers surveyed. These qualities are necessary to portray the producers' different backgrounds and their subsequent effects on the descriptive and statistical findings of the study.

4.2.1 Sex of mushroom producers

About 68% of the mushroom producers were males while 32% constituted females, as depicted in Figure 3. The results indicate that most of the mushroom producers were males, reflecting a high gender disparity among the mushroom producers surveyed.

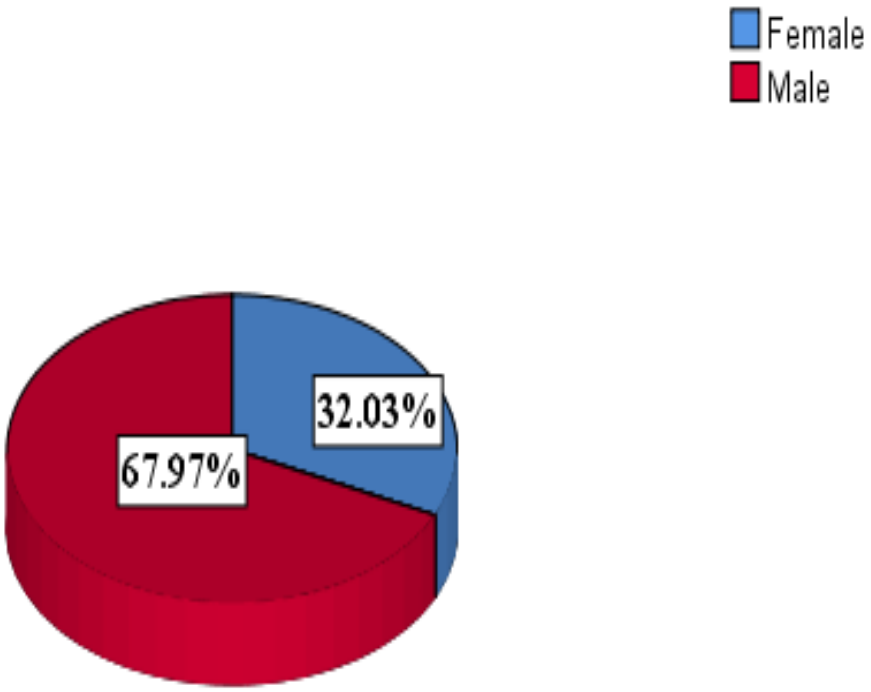

Figure 3: Sex of mushroom farmers

The result, however, contradicts Mabuza et al. (2012) who observed that most (53%) of the mushroom producers who produced mushroom in Swaziland were females. The sex of household heads is important in agricultural commercialization because it determines who controls the household resources and their allocation. Doss and Morris (2000) affirm that males have more control over resources than females in Africa. The results may be explained by the fact that the majority of the work involved in mushroom production is labour intensive and, therefore, males, who are generally stronger than females, can be involved in mushroom production more.

4.2.2 Age of mushroom producers

Less than half (28%) of the mushroom producers were within the age bracket of 21-40 years. The majority of the respondents (54.24%) were in the

age range of 41-60 years while 17.65% fell within 61-80 years, as shown in Figure 4. The average age of the respondents was 48.37 years, with a standard deviation of 12.57 years.

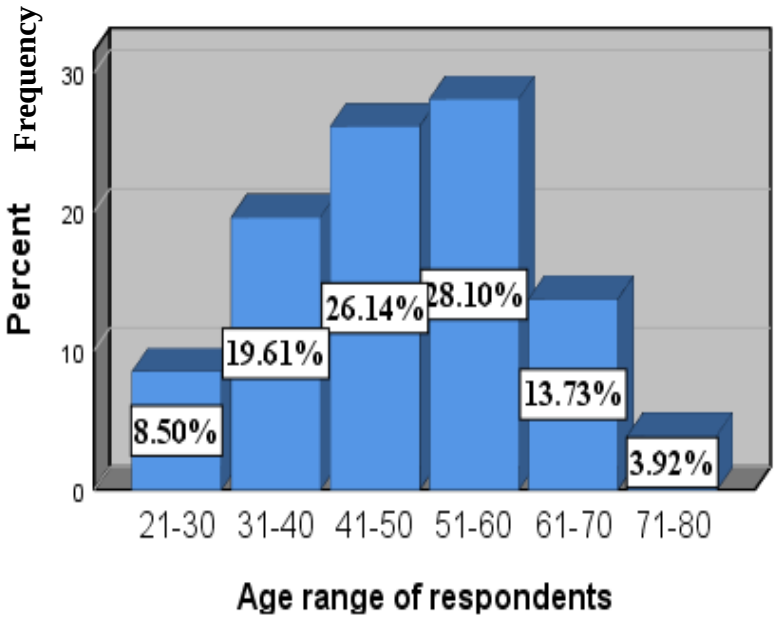

Figure 4: Age of mushroom producers. Mean = 48.37years, SD = 12.57years
Source: Field Data (2021).

The result implies that very few (28%) of the mushroom producers are youth between fifteen (15) and thirty-five (35) years, as indicated by the Ghana National Youth Policy (2010), but the majority (54%) of the producers are within the prime working age (within the age bracket of 41-60 years) whereas less than quarter (17.65%) are of mature working age (61-70 years) with only 3.92% being elderly (71-80 years), following Adeniran, Ishaku and Yusuf (2020)'s categorisation. The producers' ages were considerably variable, with a mean of 48.37 years and a standard deviation of 12.57 years. The finding

implies that mushroom is mainly produced by people of prime and mature working ages.

Ghadim and Pannell (1999) assert that age has a considerable impact on farmers' decision-making since younger farmers are more open to new ideas and have a better understanding of the benefits of non-traditional agricultural enterprises. The results also revealed that about 54 percent of the mushroom producers are relatively young (between the ages of 21 and 50), implying that younger mushroom producers are more likely to understand the benefits of non-traditional agricultural enterprises like mushroom production and, as a result, are more likely to participate in them.

4.2.3 Marital status mushroom producers

Most (81.7%) of the mushroom producers were married, while 18.3% were not married (Table 7).

Table 7: Marital status of mushroom producers

Marital status	Frequency	Percent
Married	125	81.7
Not Married	28	18.3
Total	153	100.0

Source: Field Data (2021).

Marital status influence a farmers' decision to commercialise agricultural production. This is because married farmers may explore ways of earning more income to cater for their families. For this reason, they may produce crops on a relatively large scale and sell more of the produce to earn more income to meet other needs of their families (Mabuza et al., 2013). From

the findings of this study, it appears that the majority of mushroom growers are market-oriented.

4.2.4 Quantity of mushroom harvested per year

About 55% (54.9%) of the mushroom producers produced between 101 kg and 500 kg of mushroom and 18% of them produced between 501 kg and 1000 kg per year. Less than 10% of the producers produced between 1001 kg and 1500 kg (8.5%), 1501 kg and 2000 kg (6.54%), 2001kg and 2500kg (5.23%) and 100kg and less (5.23%), 3501 kg and 4000kg (0.65%) and 4000kg (0.65%) per year, as displayed in Figure 5.

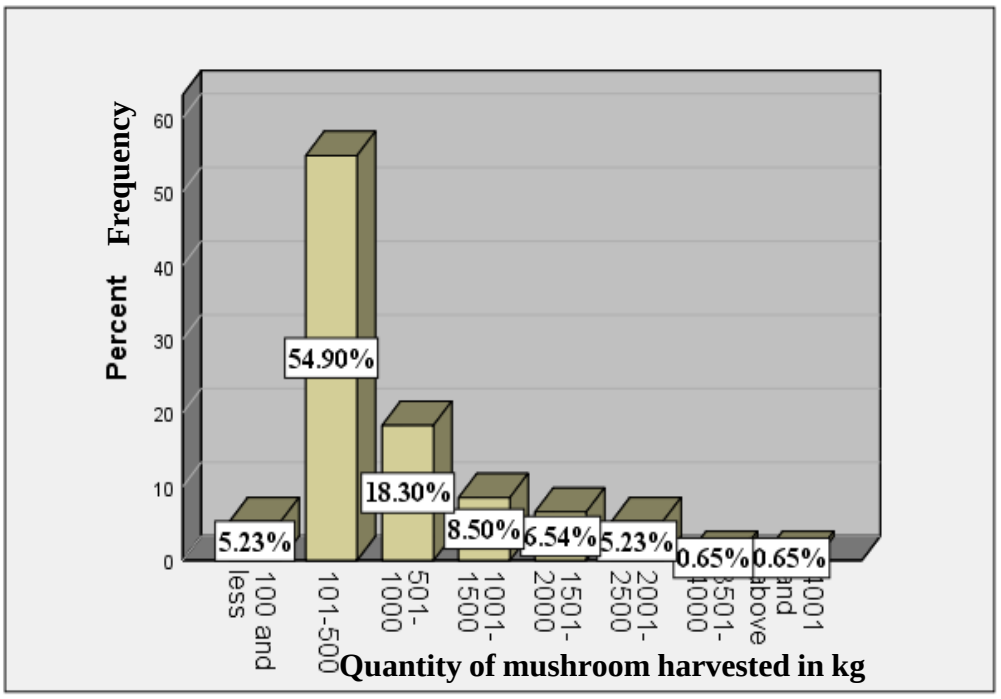

Figure 5:Average quantity of mushroom harvested in kilogram per year.
Mean = 717.00 kg, SD = 488.33 kg.
Source: Field Data (2021).

The output of mushroom is equivalent to the number of substrate bags cropped, and from one production cycle (defined as three months from compost

preparation to harvesting of mushroom), it is expected that 1 kg of fresh mushroom would be harvested from one (1) bag of the substrate (Agyeman, 2019). Therefore, farmers are expected to complete an average of three cycles of production per year (Zero Emissions Research Initiatives (ZERI), 2015) which served as the basis for determining the annual threshold of mushroom produced and sold.

The result presented in Figure 5 implies that the majority of the mushroom producers produced between 101 kg and 500kg of mushroom followed by 501kg and 1000kg per year. The mean quantity of mushroom harvested was 717 kg with a standard deviation of 488.3kg. This indicates that although the quantity of mushroom produced was highly varied, the majority of the producers produced up to 1000kg per year.

4.2.5 Quantity of mushrooms sold

The study's result revealed that 12.42% of mushroom producers sold 100kg and less of mushroom, 56.86% sold between 101 kg and 500 kg of mushroom and 16.99% of the producers between 501 kg and 1000 kg per year. About 11% of the producers sold between 1001 kg and 1500 kg per year, whereas 1.3% sold between 1501 kg and 2000 kg, 0.65% between 2001kg and 2500kg per year, and another 0.65% sold between 3001kg and 3500kg per year, as depicted in Figure 6.

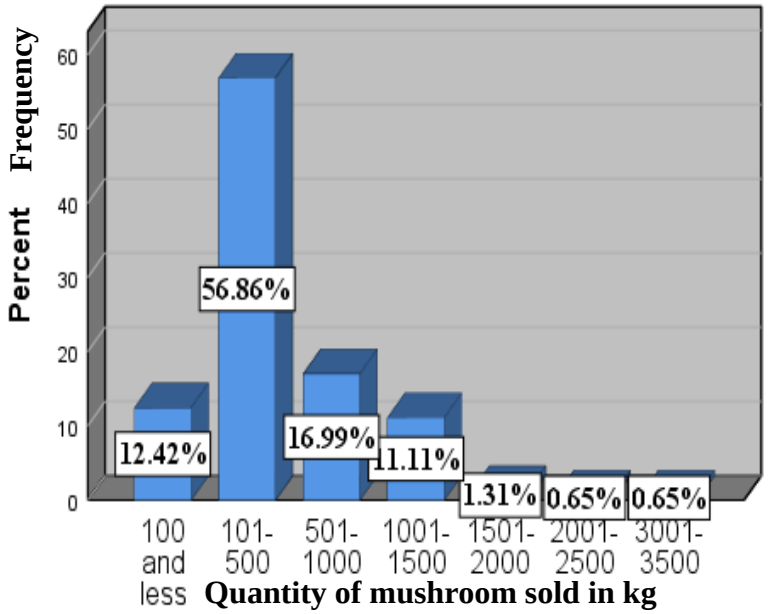

Figure 6: Average quantity of mushroom sold in kg per year.
Mean = 514.80kg, SD = 488.33kg.
Source: Field Data (2021).

The result implies that the majority of the mushroom producers sold between 101 kg and 500kg of mushroom followed by 501kg and 1000kg and 100kg and less per year. The mean quantity of mushroom sold was 514 kg per year, with a standard deviation of 488.3kg per year indicating that the quantity of mushroom sold varied greatly, however, the majority of the mushroom producers sold between 501kg and 1000kg of mushroom.

4.2.6 Access to market (output price) information

According to the study, all the mushroom producers in the study area had access to output price (market) information.

The result agrees with Abu (2015) who observed that the majority (77%) of smallholder farmers in Ghana's Upper West had access to market

information. A positive association exists between market information and agricultural commercialisation, as it helpes them to make informed marketing decisions (Martey et al., 2012; Randela et al., 2008). This means that the more market information farmers have, the more commercialised they will become. The result of this study implies that all the mushroom producers may make an informed decision about mushroom sales, allowing them to sell more of their mushroom output.

4.2.7 Sources of market (output price) information

According to the study, about 37% (56) of the mushroom producers in the study area obtained their market information from neighbours (fellow mushroom producers in their neighbourhood and relatives), 10.5% (16) from extension officers, 33.3% (51) from farmer association and 19.6% (30) from a personal visit to markets (market centers, supermarkets, restaurants and individual buyers), as shown in Table 8.

Table 8: Sources of market information

Source	Frequency	Percent
Neighbours	56	36.6
Extension officer	16	10.5
Farmer Association	51	33.3
Personal visit to the market	30	19.6
Total	153	100.0

Source: Field Data (2021).

The result mirrors Baisa (2009) who observed that most of the smallholder farmers (98.4%) obtained their market information from neigbhours, with extension officers serving as one of the least sources of market information for the smallholder farmers, as only a few (6.4%) of the farmer received market information from extension officers. The result is also consistent with Abu (2015) who found out that neighbours/relatives were among the three major sources of market (output price) information for groundnut farmers in the Upper West region of Ghana.

The results, however, contradict recent findings that extension agents (46.7%) were the second major source of agricultural information next to radio (58%) for female farmers in Tanzania (Isaya, Agunga & Sanga 2018). The study's result implies that the primary sources of market information for mushroom producers in the study area were neighbours, farmer associations, and personal visits to markets, whereas extension officers were the least reliable source of market information. This could be due to the limited number of extension agents assigned to the mushroom farmers by CSIR (three extension agents), and the limited direct involvement of MoFA in the mushroom industry which in turn affect the assignment of MoFA extension agents to the mushroom farmers in the region.

4.2.7 Land size allocated for mushroom production

The majority of the mushroom producers (86.9%) produced mushroom on land spaces of 0.9 acres and below whereas 13.1% (20) farmers produced mushroom on land sizes ranging from 1 acre to 1.9 acres, as presented in Table 9.

Table 9: Size of land used for mushroom production in acres

Land size in acres	Frequency	Percent
0.9 and less	133	86.9
1.0-1.9	20	13.1
Total	153	100.0

Mean = 0.49 acres, SD = 0.32 acres

Source: Field Data (2021).

The results imply that the majority of the mushroom producers utilized a very minimal space (less than 1 acre—0.9 acres and below) for mushroom production, consistent with Sher (2006) that mushroom production requires a relatively little space. The mean land size of 0.49 acres and a standard deviation of 0.32 acres indicate that land sizes for mushroom production by the respondents are widely varied and that the mean land used for cultivating mushroom in the study area is larger than the standard land size of 0.23 acres required for commercial mushroom production in Ghana (Dzomeku, Personal Communication, 2021).

4.2.8 Years of experience in mushroom production

The farming experiences of the mushroom producers ranged from one to fifteen years. About 72% (71.9%) of the producers had been producing mushroom for 1 to 5 years, 27.45% for 6 to 10 years and 0.65% for 11 to 15 years. Most of the mushroom producers have up to only half a decade of experience in producing (Figure 7). The mean years of mushroom production experience by the farmers were 4.56 years and a standard deviation of 1.94 years which indicates that there is not much variation in the farmers' experience with

mushroom production and that years of experience of the farmers fall closer to the mean years of experience. This implies that generally, mushroom farmers in the study area began commercialising mushroom production not long ago.

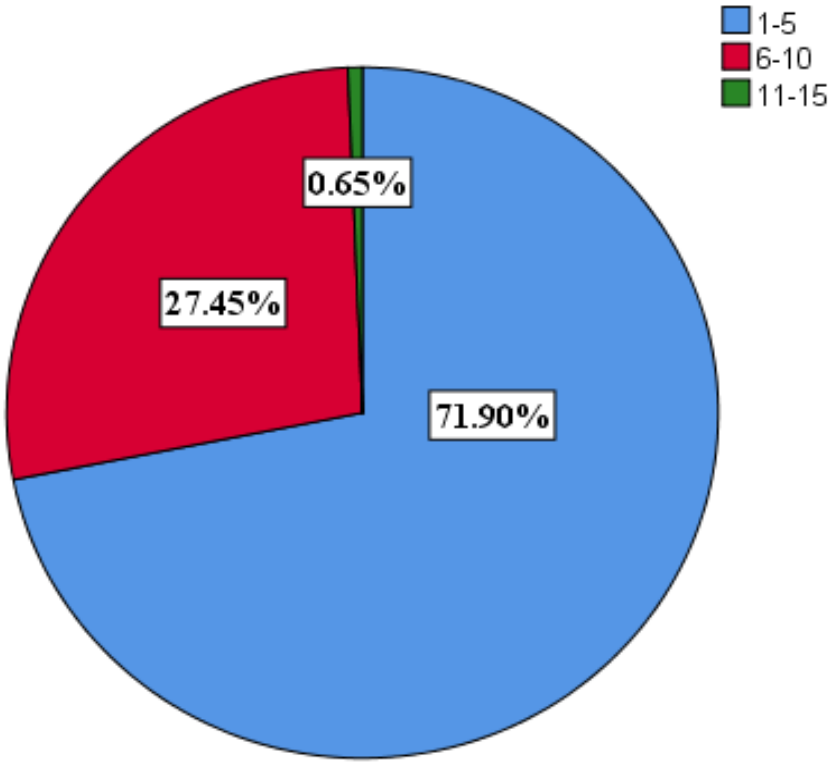

Figure 7: Years of producing mushroom
Mean = 4.56years, SD = 1.94years
Source: Field Data (2021).

The finding contrasts with those of Martey et al. (2012) and Abu (2015), who found that cassava and maize farmers in the Effutu Municipality in the Central Region had a mean farming experience of 21 years, and maize and groundnut farmers in the Upper West Region had a mean farming experience of 14 years. As a result of this study's finding, it appears that mushroom producers

in the research area have only been producing market-oriented mushrooms for a short period.

4.2.9 Price per kg of mushroom

This session presents the average price of 1 kg of fresh mushroom in the study area. According to the study's result, 85% of the mushroom farmers sold 1 kg of fresh mushroom at GHC 20.00, about 8% (7.8%) sold 1 kg of mushroom at GHC 25.00 whereas about 7% (7.2%) of the farmers sold it at GHC 15.00, as presented in Table 10.

Table 10: Average price per kg of mushroom

Price (GHC)	Frequency	Percent
15.00	11	7.2
20.00	130	85.0
25.00	12	7.8
Total	153	100.0

Mean = GHC 20.03, SD = GHC 1.94

Source: Field Data (2021).

In implication, the majority of the farmers sold 1 kg of fresh mushroom at GHC 20.00. The mean price per kg of fresh mushroom was GHC 20.00 and a standard deviation of GHC 1.94 indicates that the average prices at which all the farmers sold 1 kg of their fresh mushroom have just a little variation from the mean price, which is GHC 20.03.

4.2.10 Hired labour and Household size of mushroom farmers

The majority (85.6%) of the mushroom farmers had up to 5 dependents while a few (14.4%) of them had more (6-10) dependents (Table 12). Hired

labour follows a similar distributional pattern as dependents, presented in Table 11. About 95% (94.8%) of the household heads hired up to 5 men while only 5.2% hired more (6-10 men). On average, each household head hired 2 men, and the standard deviation of 1.64 men indicates that the number of men hired by the households is not widely varied.

Table 11: Dependants and hired labour

Dependents of household heads and Hired labour

	Dependents		Hired labour	
No.	Freq.	Percent	Freq.	Percent
1-5	131	85.6	145	94.8
6-10	22	14.4	8	5.2
Total	153	100.0	153	100.00

Dependent: Mean = 3.76 people, SD = 1.62 people. Hired labour: Mean = 2.31 men, SD = 1.52 men.

Source: Field Data (2021).

Household size is significant in agriculture in general. It determines the labour contribution a farming household can make towards agricultural enterprise (Mabuza et al., 2013). Such contribution has a high likelihood of increasing production capacity and proportion of produce sold (agricultural commercialization (Mabuza et al.). With a mean of about 4 dependants and a standard deviation of 1.64 dependents per household, the results indicate that household heads have a significantly large household size and can contribute more labour towards mushroom production which is likely to increase the production and proportion of mushroom sold.

According to Dupraz and Latruffe (2015), household size from which labour is derived for farming in most farming households in Africa complements hired labour. This means that hired labour adds up to household labour to increase labour for farming. From Table 11, the sum of the mean score of dependents and hired labour implies that the farmers very likely have many people to contribute more labour to mushroom production which according to Mabuza et al. (2013), is highly likely to increase mushroom production and commercialisation.

4.2.11 Educational level of mushroom producers

The majority (60.1%) of the mushroom farmers had tertiary education, followed by "O" Level (19%) and Senior High School (19%). The least levels of education are Junior High School and "A" Level education (0.7% and 1.3% respectively) (Table 12).

Table 12: Educational level of mushroom producers

Education level	Frequency	Percent
Junior High School	1	0.7
"O" level	29	19.0
Senior High School	29	19.0
"A" Level	2	1.3
Tertiary	92	60.1
Total	153	100.0

Source: Field Data (2021).

The study's results imply that generally, all the mushroom farmers had formal education. This is an indication that the farmers can read, understand and utilize information (output price information) to make informed decisions about

the commercial mushroom production which in turn can increase their commercialisation.

4.2.12 Mushroom farmers' reasons for producing mushroom

According to the results, the majority (66%) of the mushroom farmers produced mushroom for sale as well as for consumption and a significant number of them (34%) produced mushroom solely for sale, as shown in Table 13.

Table 13: Primary reason for producing mushroom

Reason	Frequency	Percent
Selling to the market	52	34.0
Partially for consumption and partially to sell to the market	101	66.0
Total	153	100.0

N=153

Source: Field Data (2021).

Baisa (2009) indicates that understanding the primary intention for which a farmer would cultivate just one type of crop is very important because a farmer's decision to commercialise production is in part dependent on this intention. The result implies that the common motive for all the farmers to produce mushroom was to earn income. Notwithstanding, the results also reveal food self-sufficiency as a priority of not only rural households but of urban households as well, because part of the produce was consumed. The finding concurs with Ahenkan and Boon (2010) who revealed that the main motif of

farmers' engagement in non-traditional agricultural farming is for income generation to reduce poverty and for good nutrition.

The 34% who self-reported that they produce mushroom solely for sale (Table 14) may be because they quantify the monetary value of all own-consumption (those consumed personally, those consumed by family, or those given out to friends) and account for them.

4.2.13 Non-farm activities

Most (95%) of the mushroom farmers engaged in non-farm activities. Only a few (5%), however, depended on only mushroom production for livelihood, as presented in Table 14. Non-farm activity is any activity that helps to receive cash from non-agricultural employment. These activities include but are not limited to non-agricultural wage employment, self-employment. According to Abu (2015) and Martey et al. (2012), these activities generate additional income for the farmers which they may invest in their agricultural activity such as mushroom production, which in turn may expand and increase commercialisation. The result implies that almost all the mushroom farmers engaged in such activities. The few (5%) farmers who did not engage in any non-farm activities were mainly pensioners and aged who cultivated only mushroom for a living in addition to their pension allowances. Conditioned on their non-farm engagements, the majority of the producers surveyed were in a good position to be moderately or highly commercial.

4.2.14 Primary occupation of mushroom farmers

Out of the farmers who engaged in non-farm activities, about 21% engaged in petty trading, a majority (37.67%) were public servants, 28.08% engaged in poultry farming and 13.01% engaged in poultry farming, as displayed in Figure 8.

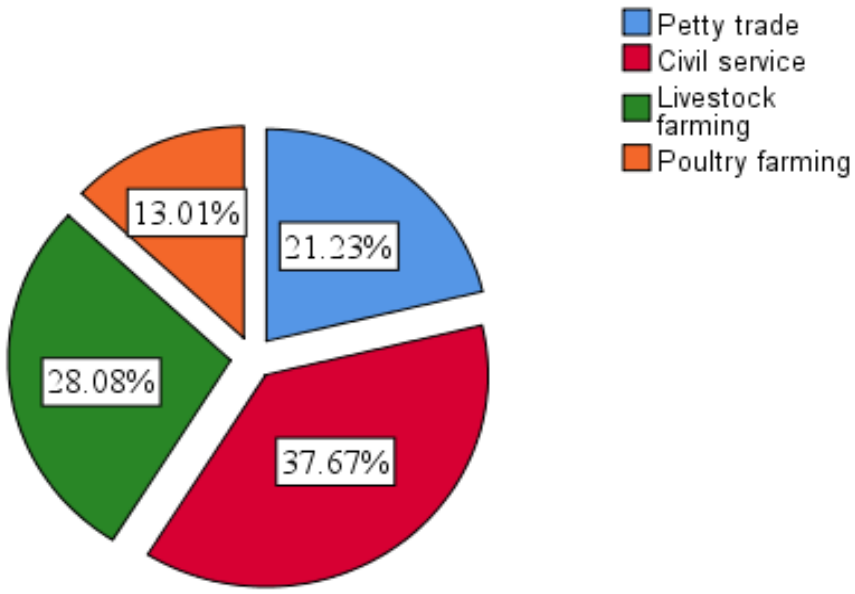

Figure 8: Primary occupation of respondents
N = 146
Source: Field Data (2021).

The result indicates that generally, mushroom production is a secondary occupation and a secondary source of income for the majority of the farmers. The result mirrors Ahenkan and Boon (2010) who found out that farmers of non-timber forest products engaged in it as a secondary occupation with the majority of them (61%) cultivating cocoa, 12.5% maize, 11.1% cassava, 10.3

% tree farming and 5.5% oil palm production as their respective primary activity. The result of this study, therefore, implies that mushroom production in the study area is a secondary activity that earns producers additional income.

4.2.15 Land Ownership

The majority of the mushroom producers (65%) owned land, as presented in Table 14. The land is key for farming. Ownership and size of land are very important for expanding agricultural production and increasing agricultural commercialization among smallholder farmers. The result implies that the majority of the farmers may be able to stay in the production business for a longer time and also be able to expand their production, as land tenure issues may not hamper them (Atteh, 1985), and is consistent with Baisa (2009) who found that most smallholder farmers in Enderta District, Tigrai, Ethiopia owned land.

4.2.16 Use of inorganic/chemical fertilizer

The result indicated that none of the producers used chemical fertilizer (Urea, NPK and Epsom salt) to produce mushroom (Table 14). The result implies that mushroom produced in the Greater Accra region is purely organic, which was the preference of consumers. The possible explanation is that producers conform to producing mushroom organically to help minimise the bad perception about mushroom being poisonous. Even though the use of chemical fertilizer is generally believed to increase production and possible commercialisation (Baisa, 2009), the results imply that meeting consumers' health preferences is key to the mushroom farmers, although they may not boost their yield which impacts negatively on mushroom commercialisation.

4.2.17 Ownership and use of mobile phone

All the mushroom producers owned mobile phones, as shown in Table 14. They also used the phones for searching for information on mushroom marketing as well. Mobile phone is an important private asset and technology noted for enhancing agricultural commercialisation by facilitating access to input, production and output price information (Abu, 2015; Baisa, 2009; Martey et al., 2012). The study's result implies that the mushroom farmers can easily access market and production information to help them in their sales decision-making.

4.2.18 Use of irrigation

The study results revealed that all (100%) the mushroom producers applied irrigation on their farm, however, the majority (73.2%) used manual irrigation whereas very few (26.8%) used mechanised irrigation, as shown in Table 14. According to Baisa (2009), applying irrigation enhances agricultural production and commercialization which in turn results in increased food security and income. Biasa found a statistically significant positive association between total crop produced and sold and use of irrigation. The result, therefore, implies that the surveyed mushroom farmers' use of irrigation may contribute to their commercialization.

4.2.19 Access to credit

About 84% of the mushroom producers did not have access to credit whereas 16% had access to credit, as presented in Table 14. According to Abu (2015) and Martey et. al (2012), getting access to credit is a big challenge to farmers. Credit serves as a source of finance for financing crop production and

increasing commercialization. Abu (2015) noted that lack of access to credit can negatively impact commercialization by reducing the quantity of crops produced. Reasons that were given for non-access include lack of availability, high collateral and high interests.

4.2.20 Membership of farmer organization

All the mushroom producers were members of farmer associations, as presented in Table 14. Membership of farmer associations has been found to positively impact agricultural commercialisation as it enhances information sharing and collective acquisition of credit and farm inputs (Olwande & Mathenge, 2012). All the producers were members of the Greater Accra chapter of MUGREAG. In implication, all the mushroom farmers have the advantage of participating more in the mushroom output market as a result of their membership in the farmer association, all other things being equal.

4.2.21 Access to extension

Less than half (about 43%) of the mushroom producers had access to extension services whereas the majority (57%) did not have access to extension services, as seen in Table 14. This is due mainly to the fact there are only three extension agents from CSIR-FRI who oversee mushroom production in the Greater Accra mushroom producers. Access to extension services is reported to have a positive contribution towards agricultural commercialisation (Martey et al. 2012). The result implies that access to extension services was low among the mushroom producers in the region due mainly to inadequate extension officers in the area.

Table 14: Non-socioeconomic characteristics of mushroom producers

Variable	Freq.	Percentage (%)
Land ownership: Yes	99	64.7
No	54	35.3
Non-farm activities: Yes	146	95.4
No	7	4.6
Use of inorganic fertilizer (Urea, NPK, Epsum salt)		
Yes	0	0
No	153	100
Own mobile phone		
Yes	153	100
No	0	0
Use of Irrigation: Yes	153	100
No	0	0
▪ Mechanised	41	26.8
▪ Manual	112	73.2
Access to credit: Yes	85	16.3
No	128	83.7
Membership of Farmer Association		
Yes	153	100
No	0	0.0
Access to Extension: Yes	65	42.5
No	88	57.5

Source: Field Data (2021).

4.2.22 Mushroom producers' annual income

From the study's results, the majority (45.8%) of the producers had an annual income in the range of GHS 1000.00 and GHS 10000.00 per year. This was followed by 31.4% whose annual income ranged from GHS 10100.00 to GHS 20000.00 and less than a quarter (16.3%) within the annual income range of GHS 20100.00 and GHS 30000.00. About 3% (3.3%) of the producers' annual income ranged from GHS 30100.00 to GHS 50000.00 whereas a few producers, 2% and 1.3% had annual incomes below GHS 1000.00 and above GHS 50000.00 respectively, as presented in Table 15.

Table 15: Mushroom producers' annual income

Mushroom farmers' income (GHS) per year	Freq.	Percent
Less than 1000	3	2.0
1000 - 10000	70	45.8
10100 - 20000	48	31.4
20100 - 30000	25	16.3
30100 - 40000	3	2.0
40100 - 50000	2	1.3
Above 50000	2	1.3
Total	153	100.0

Source: Field Data (2021).

Siziba et al. (2011) discovered that non-farm income is positively and significantly associated with agricultural commercialisation. This is because farmers may invest some or all of such income into their production which may

expand production and in turn increase the volume of sales. The results of the study, therefore, implies that all the producers stand the chance of increasing the mushroom commercialisation

4.2.23 Mechanized production facilities

The study's result indicated that the majority of the mushroom producers did not have mechanized incubation room (94.1%) and cropping room (98%), and both (98.7), as presented in Table 16.

Table 16: Kind of mushroom production facilities

Facility		Frequency	Percentage
Mechanized Incubation room:	Yes	9	5.9
	No	144	94.1
Mechanized Cropping room:	Yes	3	2.0
	No	150	98.0
Both:	Yes	2	1.3
	No	151	98.7

Source: Field Data (2021)

Mechanized incubation and copping rooms are the major technological requirement for boosting commercial mushroom production, according to (Barney, 1973). A mechanized incubation room has temperature control systems installed in it which regulates temperature levels to facilitate the growth of mycelium in the incubation room whereas mechanised cropping house has a humidifier installed to control humidity to enhance the growth and yield of the

mushroom. Rosmiza et al. (2016) advise that for mushroom to be produced at a commercial level to meet demand, mechanized growing facilities are key to ensure high yields. The study's result, therefore, implies that the mushroom producers in the study area may not be able to produce commercial quantities of mushroom due to their low use of modern technologies for production.

4.3 State of mushroom commercialization

The first objective was to describe the state of mushroom commercialisation in the study area. To achieve this, the intensity of mushroom commercialisation, degree of mushroom commercialisation, the value of mushroom produced and sold by males and females, variations in mushroom commercialisation and the characterisation of the intensity of mushroom commercialisation in the study area were computed.

4.3.1 The intensity of mushroom commercialization

First, the intensity of commercialization was measured using the ratio of the volume of output produced in value to the volume of output sold in value multiplied by 100, using the CCI. Second, the scale or degree of commercialization was determined using the volume of output sales in monetary value.

To compute the CCI, price data for each producer was imputed. It was observed that because farmers sold a kg of mushroom at different prices, the prices per kg of mushroom also varied among the farmers in the data. Using individual farmers' average prices to calculate the value of output produced and output sold would be inappropriate because of varied prices. To remedy this, the mean price of 1kg of mushroom in the study area was imputed and used for

the calculation instead of the various prices of the different producers (Saha et al., 2021).

Averagely, a typical mushroom farmer, according to this study, produced mushroom valued at GHC 14179.12 ranging from GHC 1000.00 to GHS 80000.00. per production year. On the sale side, a typical mushroom-producing household head, on average, sold mushroom worth GHC 10202.29, ranging from GHC 400.00 to GHC 62000.00 in a production year, as presented in Table 17.

Table 17: Intensity of mushroom commercialisation

	N = 153			
Variable	Mean	Std. Dev.	Min	Max
Average quantity of mushroom sold (kg)	514.80	488.33	20.00	3100.00
Average quantity of mushroom harvested per capita (kg)	717.00	713.76163	50.00	4200.00
Total value of mushroom sold (GHS)	10202.29	9440.50	400.00	62000.00
Value of mushroom produced (GHS)	14179.12	13642.02	1000.00	80000.00
Intensity mushroom of commercialisation	75.123	15.89	6.67	100.00

Source: Field Data (2021)

The intensity of commercialisation--defined as the ratio of the total value of crop sold in a production year to the total value of crop harvested in the same year expressed as a percentage--of the mushroom farmers from this study showed that on average 75% of mushroom produced was sold while the rest (25%) was consumed. The most commercialised mushroom producer sold all (100%) mushrooms harvested whereas the least commercialised mushroom producer sold only about 6.67% of mushroom harvested. The result shows a high commercialisation index for mushroom production, implying that the small-scale mushroom producers in the region were highly commercial. The result also agrees with Martey et al. (2012) who reported a high commercialisation index of 75% among cassava farmers in the Effutu Municipality. It may be deduced from the finding of this study that mushroom is grown as a cash crop in the Greater Accra Region.

World Development Report (2008) cited in World Bank (2007) stipulates that farmers who sell more than 50 percent of their output are more market-oriented. Such market-orientedness is key for driving economic transformation and important for fostering innovation and competitiveness (Mmari, 2015) cited in (Kabiti, Raidimi, Pfumayaramba & Chauke, 2016).

4.3.2 Degree of commercialization (Value of output sold)

The value of crop output sold is an alternative measure of agricultural commericialisation (Leavy & Poulton, 2008; Poulton, 2018). According to Gebreselassie and Sharp (2008), "the degree of farmers' participation in output markets could be measured either in terms of the *proportion* of output sold (the

commercialisation index), or the total *value* of output sold" and it determines the market size of sale.

The value of mushroom output sold was computed using the mean price from the data. Despite the relatively high intensity of commercialisation, the volume of mushroom sold is small. From the result, the majority of mushroom farmers (fifty-seven percent) sold mushroom worth between GHC 2020.00 to GHC 10000.00 per year, with a mean sale of GHC 10202.29 per year. About 16% (16.34%) sold from GHC 10000.00 to GHC 20000.00. Less than a quarter (14.37%) of the producers sold mushroom output worth between GHC 20000.00 and GHC 70000.00, while about 12% (12.42%) sold GHC 2000.00 or below, as shown in Figure 9.

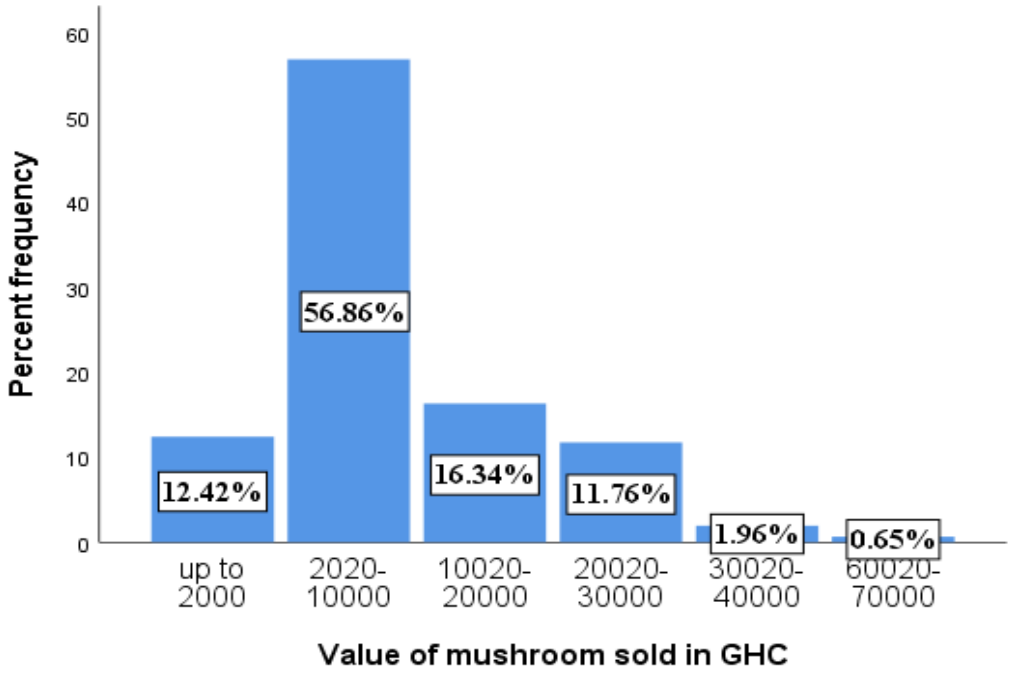

Figure 9: Degree of mushroom commercialisation by respondents in the last 12 months before the survey.

Mean = GHC 10202.29, SD = 9440.50

Source: Field Data (2021).

The result in Figure 9 indicates that none of the mushroom producers in the study area sold mushroom worth the threshold (GHC 300,000.00—equivalent to 15000 kg or 15 metric tonnes per annum set by CSIR-FRI using the current price of GHC 20.00 per 1 kg of mushroom). This implies that all the surveyed mushroom farmers are below the commercial mushroom sales level in Ghana.

4.3.2.1 The degree of mushroom commercialisation of mushroom farmers by sex of respondents

From the results of the study, females produced and sold more mushrooms (GHC 15901.22 and GHC 11278.37 respectively) on average than males who produced and sold mushroom worth GHC 13367.74 and GHC 9695.29 respectively on average, as illustrated in Figure 10.

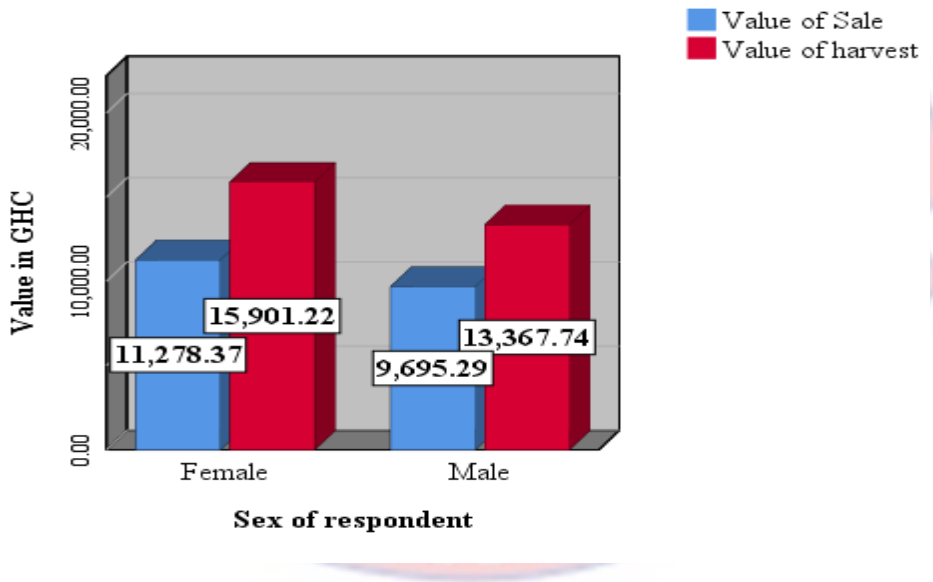

Figure 10: Average value of mushroom output produced and sold by male and female respondents.

Source: Field Data (2021).

The result may mean that females may produce and sell more mushrooms in the study area than males.

4.3.3 Characterization of the intensity of mushroom commercialization

The mushroom producers were grouped into high, medium and low commercial producers based on their commercialistion indices following Baisa (2009), who categorized farmers who sell 25 percent and less of their output as low commercial farmers, between 26 percent and 50 percent as medium commercial farmers and above 50 percent as high commercial farmers. Based on this categorisation, the study revealed that about 2% of the mushroom producers were low commercial farmers, about 3% medium and 95% high, as displayed in Figure 11.

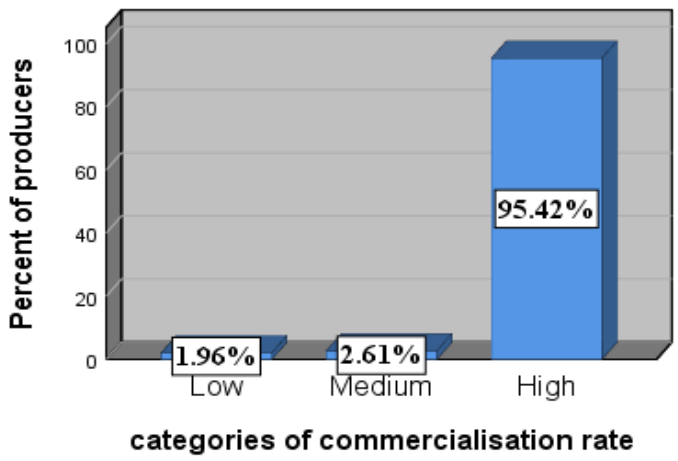

Figure 11: Characterisation of the degree of commercialisation by producers
Low commercialisation = 25% and below, Medium commercialisation = 26% - 50% and High commercialisation = 51% and above (Baisa, 2009).

Source: Field Data (2021).

According to the result, the majority (about 95%) of the mushroom producers were high commercial farmers, followed by medium (2.61%) and low (1.96%), as depicted in Figure 11. The result also revealed that more mushroom producers were highly commercialised than there was medium, and more farmers were medium commercialiased than there were low commercial mushroom farmers. The distribution of the intensity of mushroom commercialisation is consistent with Abu (2015) who found that for groundnut farmers in the Upper West region, 7.8 percent were low commercial farmers, 27.5 percent were medium commercial farmers and 64.7 percent were high commercial farmers. Also, Martey et al. (2012) observed that the proportion of cassava sold by 90% of cassava producing farmers in the Effutu Municipality ranged from 81% to 100% which indicates that most of the cassava farmers in the Effutu Municipality were highly commercial. The study result confirms that crop commercialisation in Ghana is not uniformly low, medium or high, and the majority of farmers participating in the output market are highly commercial, selling more than half of their produce.

4.4 Motivating factors of mushroom commercialisation

To identify factors that motivate farmers to commercialise mushroom, Principal Component Analysis (PCA) was used. The goal of PCA was to identify latent variables that explain the proportion of variance that exists between observed variables (Field, 2013; Kabacoff, 2015). An item loading threshold of 0.4 was used to include an item loading on a factor (Hair et al., 2014). As a result, three items on the "motivating factors" scale were suppressed or not included in the factor extraction. These items are "I can grow mushroom

at any time of the year," "I can easily access mechanized services in and around my community for incubation and cropping," and "I earn a reliable and stable income from mushroom production." These excluded items reduced the items or variables on the scale from thirteen (13) to ten (10). The 10 variables and the 153 subjects used for the PCA analysis in this study were good for the analysis according to Pallant (2013) who recommended that a minimum of 5 variables are required to run a PCA, and Bryman and Cramer (1990), that a minimum of 5 subjects per variable and a total of not less than 100 subjects in the total sample are required to perform PCA. The data was appropriate for PCA: a good Kaiser–Meyer Olkin Measure of Sampling Adequacy (KMO > 0.5) was obtained for motivation (0.61), with a significant Barlett test (χ^2 (45) =168.030, $P < 0.01$), and an overall Cronbach's alpha value of 0.54.

The number of principal components (factors) was determined and confirmed using the eigenvalue criterion (Kaiser criterion) and parallel analysis respectively (Bento, 2020; Gniazdowski, 2021). Factors with eigenvalues greater than 1 were accepted and compared with the simulated random eigen values generated by the Monte Carlo parallel analysis. The parallel analysis was combined with the Kaiser criterion (eigenvalue criterion) to determine the number of factors to extract because the Kaiser criterion can sometimes result in the extraction of too many or too few factors (Gniazdowski, 2021), but parallel analysis presents precise and more accurate components or factors to be extracted. Components with eigenvalues from the real data (Kaiser criterion) greater than the simulated eigenvalues were therefore confirmed as the extracted factors. The extracted factors were named based on their contents (Hair et al.,

2014). Varimax rotation was used to interpret the motivating factors because the factors were expected to be uncorrelated, while the degree of coherence within each factor and the overall scale coherency were determined based the Cronbach's alpha values and mean inter-item correlation (Briggs & Cheek, 1986; Pallant, 2013; Paulsen & BrckaLorenz, 2017).

The study's result initially produced four (4) factors (looking at the column "Component" in Table 18) based on the Kaiser eigenvalue criterion in the column "Total". However, parallel analysis, based on the simulated data set and replicated 100 times, generated a random and acceptable eigenvalue of 1.0932 (Table 19) which was greater than the acceptable eigenvalue of 1.024 generated by the Kaiser eigenvalue criterion (Table 18). The parallel analysis provided a basis to decide how many factors to extract by comparing the eigenvalues from the simulated data set with that of the actual data set (Çokluk & Koçak, 2016). Based on this, the fourth factor was dropped because it had an eigenvalue lower than that of the simulated data set. Hence, the first three factors were confirmed, as presented in Table 18.

Two essential pieces of information are supplied in the "Rotation Sums of Squared Loadings" (Table 18). First, there is the "% of variance" column, which displays how much variance is explained by each of the detected components, in order from the most to the least amount of variance (Cohen et al., 2007). The first factor accounted for 17.67% of the variance in the total (10) variables, the second component for 16.72% of the total variance and the third factor for 16.03% of the total variance. The degree of variance in each component is unrelated to the other factors since each factor is unconnected to

the others. This displays which components have the most and least explanatory power (Cohen et al., 2007). In the column 'Cumulative', the three factors identified accounted for 50.41% of the overall motivation for mushroom commercialization (of the 10 variables) which according to Hair et al. (2014), is a good amount of explanatory power.

Table 18: Eigenvalues of motivating factors

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.073	20.730	20.730	2.073	20.730	20.730	1.767	17.671	17.671
2	1.657	16.571	37.301	1.657	16.571	37.301	1.671	16.715	34.386
3	1.311	13.113	50.414	1.311	13.113	50.414	1.603	16.028	50.414
4	1.024	10.239	60.653						
5	.862	8.617	69.270						
6	.774	7.743	77.013						
7	.658	6.581	83.595						
8	.650	6.500	90.095						
9	.534	5.344	95.439						
10	.456	4.561	100.000						

Source: Field Data (2021).

Parallel analysis (Table 19) was used to confirm the number of factors because it has been shown in many research (Reilly & Eaves, 2000; Sarff, 1997;

Velicer, Eaton & Fava, 2000, 2000; Wang & Weng, 2002) to give better results. Using the Monte Carlo Simulation Technique, a random simulative data set was generated besides the actual data set of the motivation for mushroom commercialisation and the estimated eigenvalues calculated.

Table 19: Parallel Analysis for motivation factor retention

Eigenvalue #	Random Eigenvalue	Standard Dev
1	1.4058	.0643
2	1.2904	.0469
3	1.1888	.0343
4	1.0932	.0391
5	1.0250	.0368
6	0.9408	.0301
7	0.8801	.0342
8	0.8039	.0304
9	0.7293	.0423
10	0.6428	.0413

Number of variables =10, Number of subjects = 153, Number of replications =100

Source: Field Data (2021).

When comparing the eigenvalues generated by the Kaiser criterion and the parallel analysis criterion in Table 18, column "Total" under "Initial Eigenvalues" and Table 19, column "Random Eigenvalues" respectively, the eigenvalue of the first factor in the real data set (Kaiser criterion) is 2.073, but it is 1.4058 in the simulation data set (parallel analysis). The eigenvalue of the second factor in real data is 1.657, but it is 1.2904 in simulation data set. The

third factor in real data has an eigenvalue of 1.311, whereas it has an eigenvalue of 1.1888 in simulation. The situation changes as we move from the third to the fourth factor, and the number of factors is limited to three, as shown in Table 18, because the eigenvalue of the fourth factor in the simulative data (1.0932) is larger than that of the real data set (1.024) (Table 18). The last comparison was the point at which parallel analysis guided the retention of the three motivating factors for mushroom commercialization by introducing a judgment regarding the number of factors (Çokluk & Koçak, 2016).

Table 20: Component loadings for motivating factors of mushroom commercialisation

Motivating items	Component 1	Component 2	Component 3
Current consumers are very much aware of mushroom benefits	0.757		
My social environment accepts mushroom production.	0.642		
Mushroom addresses concern about my family's health	0.594		
Mushroom sells fasters		0.810	
There are premium prices for mushroom		0.673	
Inputs are readily available		0.483	
There is a more secure market for mushroom		0.474	
I find mushroom production profitable			0.781
Mushroom contributes to food security			0.586
My social environment regards mushroom production as a promising employment opportunity			0.478
Eigenvalue	2.07	1.66	1.31
Variance explained	17.67	16.72	16.13
Cronbach's alpha	.56	.50	.42

Source: Field Data (2021).

PCA on motivation generated a model made up of three components, with eigenvalues 2.073, 1.657 and 1.311 for Component 1, Component 2 and Component 3 respectively, as presented in Table 20. These eigenvalues were all greater than that of the Monte Carlo parallel analysis' random eigenvalue (1.0932) in Table 20. The components accounted for 50.4% of the variance in the data. The Cronbach's alpha demonstrated an acceptable to moderate coherence within the variable of the factors 1 and 2 with 0.56 and 0.50 and 0.42 for factor 3. The Cronbach's alpha for the overall ten-item motivation scale used for the analysis is 0.54, indicating that the scale less is reliable. The first component captured issues of 'Current consumers are very much aware of mushroom benefits', 'My social environment accepts mushroom production' and 'Mushroom addresses concern about my family's health' and was hence named '*social awareness'.* This factor indicates that the mushroom farmers were motivated to produce and sell mushroom by how members around them view mushroom production and its (health) positive impact on them.

The second component, '*market incentives'*, captured issues of 'Mushroom sells faster', 'There are premium prices for mushroom', 'Inputs are readily available' and "There is a more secure market for mushroom", indicating that the combination of market forces that influence supply is a motivating factor for producing and selling mushroom.

Finally, the third component was named '*economic value',* and consisted of items related to 'I find mushroom production profitable', 'Mushroom contributes to food security', and 'My social environment regards mushroom production as a promising employment opportunity', suggesting that

the mushroom producers were also driven by the economic value of mushroom to commercialise mushroom. The result is consistent with Ahenkan and Boon (2010) who found out the commercialization of non-timber forest products (NTFPs) including mushroom contributes significantly to food security and livelihood improvements in Ghana.

4.4.1 Proposed Conceptual framework of motivation for mushroom commercialisation

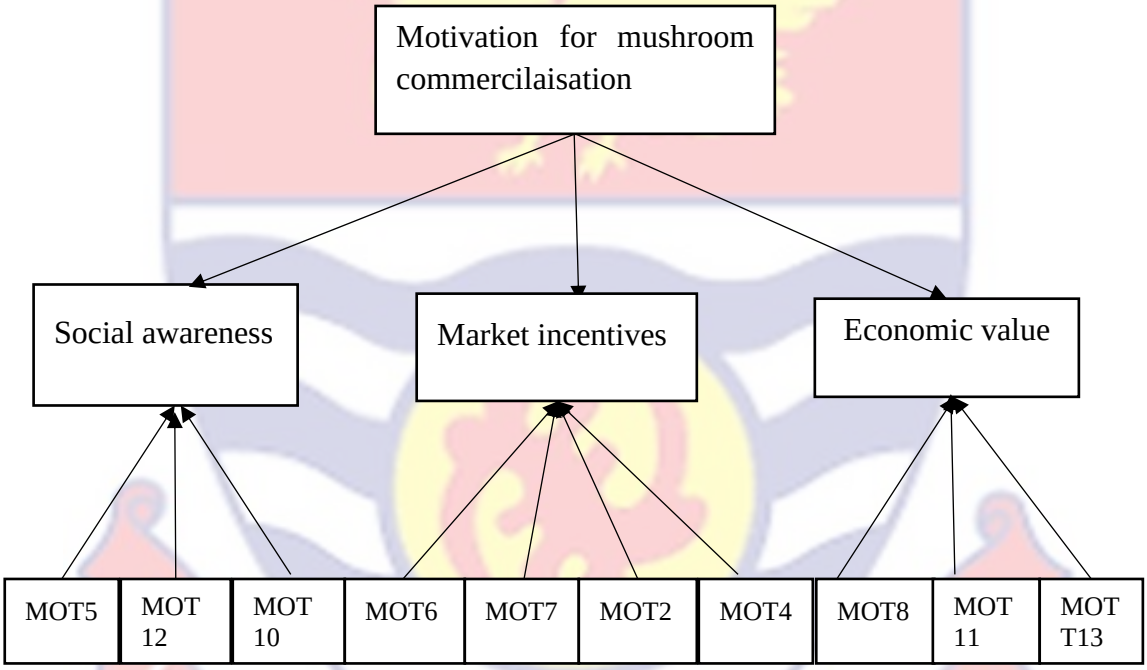

Figure 12: Conceptual framework of motivation for mushroom commercialisation.

Source: Field Data (2021).

Table 21: Key to the conceptual framework

Symbol	Manifest variable
MOT2	Inputs are readily available
MOT4	There is a more secure market for mushroom
MOT5	Current consumers are very much aware of mushroom benefits
MOT6	Mushroom sells faster
MOT7	There are premium prices for mushroom
MOT8	I find mushroom production profitable
MOT10	Mushroom addresses concern about my family's health
MOT11	Mushroom contributes to food security
MOT12	My social environment accords me with high social status for producing mushroom
MOT13	My social environment regards mushroom production as a promising employment opportunity

Source: Field Data (2021).

From the PCA results for motivating factors of mushroom commercialization, a conceptual framework of motivation for mushroom commercialization (Figure 12) was proposed by the researcher. According to the framework, the motivating factors for mushroom commercialization are social awareness, market incentives and economic value, as presented in Figure 10. Using robust analysis such as PCA to identify motivating factors of mushroom commercialization is deemed robust and most appropriate (Costello & Osborne, 2019; Osborne & Costello, 2009; Yong & Pearce, 2013). The proposed framework in Figure 10 with its associated PCA procedure is still at

the exploratory phase and is only to serve as a guide to follow in measuring, identifying and analysing motivating factors of mushroom commercialization in future analysis which would contribute better to understanding the motivating factors of mushroom commercialization.

4.5 Inhibiting factors of mushroom commercialisation

Objective four sought to identify the underlying dimensions of inhibiting factors of mushroom commercialization using PCA. The appropriateness of the data for the PCA was ensured based on the following: a satisfactory Kaiser–Meyer Olkins Measure of Sampling Adequacy (KMO > 0.5) was obtained for inhibiting factor-scale (0.59) and the analysis showed the significance of the Barlett test for inhibition (χ^2 (28) =66.151, $P < 0.01$). An item loading threshold of 0.4 was used to include an item loading on a factor (Hair et al., 2014). As a result, three items on the "inhibiting factors" scale were suppressed or not included in the factor extraction. These items were "I do not get access to adequate quality spawns," "I find mushroom production risky," and "I do not receive marketing information." These excluded items reduced the items or variables on the "Inhibiting factor" scale from eleven (11) to eight (8), which is deemed acceptable for factor analysis, according to Pallant (2013). The degree of coherence within each factor and the overall scale coherency were determined based the Cronbach's alpha values and mean inter-item correlation (MIC) (Briggs & Cheek, 1986; Pallant, 2013). The overall scale reliability was fairly strong, with a Cronbach's alpha of 0.48.

According to the results of the study, three (3) components were produced (looking at the column "Component" in Table 22) based on the Kaiser criterion in the column "Total". However, parallel analysis, based on a simulated data set and 100 times replication, generated a random and acceptable eigenvalue of 1.0293 (Table 23) which was less than the acceptable eigenvalue of 1.157 generated by the Kaiser criterion (Table 22). Because the eigenvalue from the parallel analysis was less than the actual data (Kaiser criterion), all three components were maintained (Table 22). Cronbach's alpha values and mean inter-item correlations for Factor 1, 2 and 3 are 0.48., 0.38 and 0.31; and 0.19, 0.18 and 0.21 respectively, indicating an acceptable and moderate cohesion within the set of items constituting each of three-component solutions.

Table 22: Eigenvalues of inhibiting factors

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.772	22.146	22.146	1.772	22.146	22.146	1.595	19.939	19.939
2	1.239	15.491	37.637	1.239	15.491	37.637	1.310	16.370	36.309
3	1.157	14.464	52.101	1.157	14.464	52.101	1.263	15.792	52.101
4	.924	11.551	63.652						
5	.836	10.450	74.102						
6	.765	9.563	83.665						
7	.672	8.399	92.064						
8	.635	7.936	100.000						

Source: Field Data (2021).

The column labeled "% of variance" in the "Rotation Sums of Squared Loadings" (Table 22) illustrates how much variance is explained by each of the components identified, in order from the greatest amount of variance to the least

amount of variance (Cohen et al., 2007). The first factor accounted for 19.94% of the variance in the total (8) variables, the second factor accounted for 16.37% of the total variance, and the third factor accounted for 15.79% of the overall variance. The degree of variance in each factor was unrelated to the other factors since each factor was not connected to the others. This displays which factors had the most and the lowest explanatory power among the 8 variables (Cohen et al., 2007). In the column 'Cumulative', in the "Rotation Sums of Squared Loadings", a total of 52.101% of the total inhibition for mushroom commercialization was accounted for by the 3 components, which according to Hair et al. (2014), is a good amount of explanatory power in the Social Sciences.

Table 23: Monte Carlo parallel analysis

Eigenvalue #	Random Eigenvalue	Standard Dev
1	1.3745	.0848
2	1.2348	.0449
3	1.1245	.0331
4	1.0293	.0336
5	0.9372	.0307
6	0.8520	.0400
7	0.7716	.0418
8	0.6760	0462

Number of variables = 8, Number of subjects = 153, Number of replications = 100.

Source: Field Data (2021).

Parallel analysis (Table 23) was run and the estimated eigenvalues were calculated. This was replicated 100 times. Comparing the two eigenvalues in Table 22, column "Total" under "Initial Eigenvalues" and Table 23, column "Random Eigenvalues", it can be seen that the eigenvalue of the first component in the actual data set is 1.772, but it is 1.3745 in the simulation data set. In the real data, the eigenvalue of the second factor is 1.239, whereas in the simulation, it is 1.2348. In the real data, the third element has an eigenvalue of 1.157, whereas in the simulation, it has an eigenvalue of 1.1245. When we move from the second to the third factor, the trend changes, and the number of factors is limited to three since the eigenvalue of the third factor in the simulative data (1.1245) is lower than that of the actual data (1.157), as shown in Table 23. This was the point at which parallel analysis informed the retention of the three factors for mushroom commercialisation (Çokluk & Koçak, 2016).

Table 24: Component loadings of inhibiting factors of mushroom commercialisation

Inhibiting items	Component 1	Component 2	Component 3
I find it difficult to acquire land for mushroom production due to land tenure problems	.703		
No certifying agencies to check mushroom standards	.674		
My social environment sees me as inferior for producing mushroom	.592		
I have inadequate mushroom production and management skills	.493		
Current consumers are limited in their utilization of mushroom		.748	
I do not have access to any organisation involved in the processing of mushroom		.685	
Current consumers do not consume mushroom all the time so I do not get orders all the time			.813
Current consumers dictate the price of mushroom			.599
Eigenvalue	1.77	1.24	1.16
Variance explained	19.94	16.37	15.79
Cronbach's alpha	.48	.31	.31
Mean Inter-item correlation (MIC)	.19	.18	.21

Source: Field Data (2021)

The PCA on inhibiting factors produced a model made up of three components which accounted for 52% of the variance in the data set, as shown in Table 23. The eigenvalues of factors 1, 2 and 3 were 1.772, 1.239 and 1.157 respectively (Table 24), which were all greater than the minimum eigenvalue (1.0293) generated by the parallel analysis shown in Table 22. The Mean Inter-item Correlations (MICs) of the components were 0.194 for the first component, 0.18 for the second component and 0.21 for the third component, all of which are above the minimum MIC of 0.15 recommended by Paulsen and BrckaLorenz (2017). This indicates that there is an acceptable cohesion between the items of all the factors to moderately represent the underlying constructs. The MICs of the factors are reported instead of their Cronbach's alpha values because the Cronbach's alpha values of the factors are a bit low due mainly to the fewness of the items measuring the factors (below 10). In such a situation, scholars recommend reporting the MIC instead of Cronbach's alpha values (Pallant, 2013).

Although the second and the third components' loadings were below the minimum item loading (at least three items on each component) suggested by Hair et al. (2014), Worthington and Whittaker (2006) maintain that researchers can keep a factor (with fewer variables than the necessary minimum) only if they can interpret it in a meaningful way, regardless of how strong or weak the empirical evidence for its retention is. However, Briggs and Cheek (1986) caution that in such a situation, the variables must have strong loadings (0.45 and above). Following this position, Yoo and Donthu (2001) developed a Scale with 4 dimensions having a total of 9 items, where three of

the four components had two items loading on each. Following the preceding scholarship, the two-item factor (value chain challenge) is maintained and explained based on its practical significance of contributing to explaining inhibiting factors of mushroom commercialization.

The first component, *"institutional constraints and personal weaknesses"* constituted inhibitions that reflect the view that mushroom commercialization can be hindered by the absence of institutional support and weaknesses on the side of the farmers. This factor consisted of institutional constraints including "No certifying agencies to check mushroom standards," and "I find it difficult to acquire land for mushroom production due to land tenure problems"; and personal weaknesses including "My social environment sees me as inferior for producing mushroom" and "I have inadequate mushroom production management skills". The result agrees with Schunko et al. (2019) that one of the policy factors that hinder the commercialization of non-timber wild plants including mushroom is the lack of food safety regulations. Food safety regulations or guidelines define which food and medicinal can be marketed by whom thereby setting standards for the product. Lack of such support hinders mushroom producers from meeting local consumers' preferences and entering the international market, as consumers are not certain of the safety of the mushroom products. The finding also agrees with Thilakaratna and Pathirana (2018) who found out that lack of knowledge in mushroom cultivation and disease management was a major constraint to mushroom production and commercialization in Kuruwita. Good mushroom

production management skills ensure that the production environment is controlled to ensure high yield and quality marketable fruits.

Regarding land size, although it has been widely posited that mushroom business requires small space for establishment (Ferchak & Croucher, 1993; Rosmiza et al., 2016), the study's result contrasts such a proposition. The study reveals that land acquisition is a challenge to commercial mushroom production due to land tenure issues which corroborate the observation of Barney (1973) a large-scale commercial mushroom production requires a large space to expand production structures and to accommodate sophisticated, highly technological equipment. Hence, the study argues that limited space is required to support subsistence or small-scale commercial mushroom production but not large-scale commercial mushroom production.

The second component related to value chain issues, and was termed "*value chain challenge.*" This factor indicates that another major challenge to mushroom commercialisation in the view of the respondents is weakness in the mushroom value chain, which included items such as "Current consumers are limited in their utilization of mushroom" and "I do not have access to any organisation involved in the processing of mushroom." The result agrees with Mabuza et al. (2013) that the availability of marketable surplus and mushroom producers' attempts to sell in the major markets in Swaziland are hindered by a poorly governed value chain. The finding also conforms with Ahenkan and Boon (2010) who found that less awareness creation of the health benefits of NTFPs including mushrooms, hindered their commercialisation.

The final component related to inconsistency in the mushroom output market and was therefore termed "*market uncertainty*." This component indicated that one of the major impediments to mushroom commercialisation, according to the respondents, is market uncertainty, which includes variables such as "Current consumers do not consume mushroom all the time so I do not get orders all the time" and "Current consumers dictate the price of mushroom." This result is consistent with Ahenkan and Boon (2010) who found that market uncertainty (unstable output prices) resulting from informal ways of marketing and absence of market information constituted a part of the major challenge to commercialization of NTFPs in Ghana.

4.5.1 Proposed conceptual framework of challenges of mushroom commercialisation

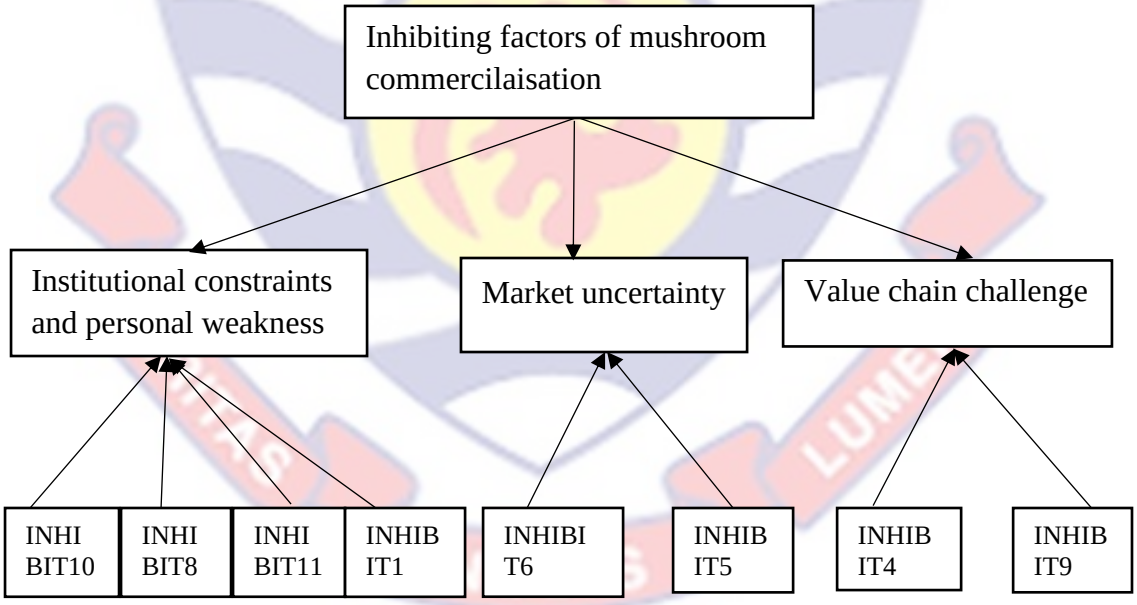

Figure 13: A proposed conceptual framework of challenges of mushroom commercialisation.

Source: Field Data (2021).

Table 25: Key to the conceptual framework

Symbol	Manifest variable
INHIBIT1	I have inadequate mushroom production management skills
INHIBIT4	Current consumers are limited in their utilization of mushroom.
INHIBIT5	Current consumers dictate the price of mushroom
INHIBIT6	Current consumers do not consume mushroom all the time so I do not get orders all the time.
INHIBIT8	No certifying agencies to check mushroom standards.
INHIBIT9	I do not have access to any organisation involved in the processing of mushroom.
INHIBIT10	I find it difficult to acquire land for mushroom production due to land tenure problems.
INHIBIT11	My social environment sees me as inferior for producing mushroom.

Source: Field Data (2021).

According to the proposed framework (Figure 12), the inhibiting factors to mushroom commercialisation were institutional constraints and personal weaknesses, market uncertainty and value chain challenge, as shown in Figure 12. The use of PCA to identify inhibiting factors of mushroom commercialization is deemed robust and most appropriate (Costello & Osborne, 2019; Osborne & Costello, 2009; Yong & Pearce, 2013).

4.6 Key contributions of CSIR-FRI towards mushroom commercialisation

Objective five sought to identify the key contributions of CSIR-FRI towards mushroom commercialisation in the study area, and this was done through consultation with the Head of the Mushroom Unit of the CSIR-FRI. Four main services the unit provides to the mushroom farmers in the Greater Accra region were identified as Training on mushroom cultivation technologies, Extension and farm visits, Supply of spawns and Supply of compost bags. The four services were presented to the mushroom farmers to rank them according to the extent to which they benefited (received) from those services in the production year. The ranking includes an in-built test of agreement approach, in which the mean of scores is calculated based on the number of people who ranked the service. The ranking of the contributions was done using the Garrett ranking technique. The contributions were discussed in order of decreasing benefits.

Using the Garrett Ranking Formulae and the Garrett Ranking Conversion Table (Appendix A), the Garrett ranks were calculated (Garrett, 1981). The formulae were used to calculate the percentage position of each rank, and the Garret Table was used to convert the percentage position values into Garrett Values. (Garrett & Woodworth, 1969). Below is the Garrett Formulae:

Percent position = 100(Rij – 0.5)/Nj

Where Rij = Rank provided for the ith variable by the jth respondent;

Nj = number of variables ranked by the jth respondents.

The estimated percent position was translated into scores using Garrett

Table. The scores of each producer were then applied to each CSIR-FRI service (Garrett, 1981). The total value of the scores and mean values of scores were determined. The CSIR-FRI service with the highest mean value was adjudged the most important contribution, that is, farmers who benefited from that service. (Garrett & Woodworth, 1969). The calculated value and the corresponding Garrett values are presented in Table 26.

Table 26: Percent Position and Garrett Values

S. No.	100(Rij-0.5)/4	Calculated Value	Garrett Value
1	100(1-0.5)/4	12.5	72
2	100(2-0.5)/4	37.5	56
3	100(3-0.5)/4	62.5	43
4	100(4-0.5)/4	87.5	26

N= 153,

Source: Field Data (2021).

The Garrett ranking technique was used to rank CSIR-FRI's contributions to mushroom commercialisation in the study area based on ranks assigned to the services by the mushroom producers. The results revealed that from the respondents' view, the service they benefited from most from CSIR-FRI towards mushroom commercialisation was Training on mushroom cultivation technologies (64.88%), followed by Supply of spawns (55.20%), Extension and farm visits (41.06%) and Supply of compost bags (36.89%), as presented in Table 27.

Table 27: Ranking of CSIR-FRI Services (contribution) towards mushroom commercialisation

S/N	CSIR-FRI Services	1st	2nd	3rd	4th
1	Training on mushroom cultivation technologies	97	45	8	3
2	Extension and Farm Visits	11	18	74	50
3	Supply of Spawns	44	69	22	18
4	Supply of Compost Bags	5	15	58	75

N= 153,

Source: Field Data (2021).

Table 28: Calculation of Garrett Value and Ranking

S/N	CSIR-FRI Services	1st	2nd	3rd	4th	Total	%	Rank
1	Training on mushroom cultivation technologies	6984	2520	344	78	9926	64.88	1st
2	Extension and Farm Visits	792	1008	3182	1300	6282	41.06	3rd
3	Supply of Spawns	3168	3864	946	468	8446	55.20	2nd
4	Supply of Compost Bags	360	840	2494	1950	5644	36.89	4th

N= 153

Source: Field Data (2021).

4.6.1 Training on mushroom cultivation technologies

Training on mushroom cultivation technologies, according to the results, ranked highest with a Garrett mean score of 64.88%, as presented in Table 28. This indicates that mushroom producers benefited from the training service of CSIR-FRI the most, and therefore, was ranked as the important contribution of CSIR-FRI towards mushroom commercialisation in the Greater Accra region. Agricultural training has been related to increased productivity and poverty alleviation and is noted for being an effective technique of disseminating relevant new technologies (Nakano, Tsusaka, Aida & Pede, 2018). Training provides salient information on new technologies and good management practices which according to Gautam, Schreinemachers, Uddin and Srinivasan (2017) when adopted, can lead to good agricultural practices among farmers which translate into high yield and income.

Gautam et al. (2017) observed that farmers who received training had a better understanding of insect pests and pesticide use, adopted more IPM methods, and reduced the frequency of spraying and mixing different pesticides while attaining a higher output and gross margin. Nakano et al. (2018) also observed that the dissemination of rice production technologies to farmers who had access to extension increased their paddy rice output from 3.1 to 5.3 tons per hectare, but the output of the farmers without extension contact increased from 2.6 to 3.7 tons per hectare.

Training on mushroom cultivation technologies received higher appreciation from the mushroom farmers in the region because the CSIR-FRI, which is in charge of mushroom development and commercialization, is

stationed in the region and is closer to the study area. It organises occasional training on mushroom production for the producers both at a fee and for free, which they regard as very helpful in increasing their productivity and marketed surplus. Training, therefore, enhances mushroom commercialisation is by minimising the perceived complexity associated with mushroom production among producers and improving the observability and adaptability of the mushroom production to their environment (Foster & Rosenzweig, 1995).

4.6.2 Supply of spawns

The supply of spawn was the second most important contribution of CSIR-FRI towards mushroom commercialisation perceived by the producers, with a Garret mean score of 55.20 (Table 28). Growers must utilize certified spawn for commercial production since spawn quality is a critical aspect of producing profitable mushroom crops. This result concurs with Gateri et al. (2009). CSIR-FRI is the certified body to produce spawns in Ghana and is a trusted source for quality spawns for mushroom production. However, not only should the spawn be of good quality, but they should also be available and accessible in quantities large enough to meet the demands of producers (Ahenkora et al., 2013). Although CSIR-FRI is the certified body to produce spawns in Ghana, its production capacity is too low to meet mushroom producers' demand. The negative effect of the low capacity is that producers have to rely on uncertified individual spawn producers to make up for the deficit which leads to farmers acquiring less viable spawns. This situation oftentimes results in low and poor-quality yield, thereby, hindering farmers commercialization.

4.6.3 Extension and farm visits

This contribution ranked third in the study area, with a Garret mean score of 41.06 (Table 28). Currently, there are only three (3) mushroom extension officers from the CSIR-FRI serving the Greater Accra region. This implies that the majority of the farmers are either not visited, have a few contact times or cannot get access to the extension officers. This contribution being ranked third means that producers do not benefit (receive such service) much from the CSIR-FRI extension service which may be due to the inadequate number (3) of mushroom extension officers at CSIR-FRI.

4.6.4 Supply of compost bags

Supply of compost bags ranked last of all the contributions CSIR-FRI makes towards mushroom commercialisation in the study area, with a Garrett mean score of 36.89 (Table 28). Some mushroom producers prefer buying compost bags from CSIR-FRI to making the bags themselves because they believe that if CSIR-FRI produces the bags, contaminated bags will be reduced than if they were produced by the farmers themselves. Also, already made compost bags reduces the production period since the farmer begins the production from cropping rather than from composting. This, therefore, increase the number of production cycles per year which all other things being equal, leads to increased harvest per year. Its lowest rank may be due to inadequate compost bags production and supply by CSIR-FIR which makes producers unable to access the quantity they want to increase their production capacity towards commercial production and sales.

4.7 Factors predicting the degree of mushroom commercialisation

The findings of the OLS regression model assessing the determinants of the degree of mushroom commercialisation are presented in this section.

The total value of mushroom sold (degree of commercialization), which is an alternative measure of commercialization (Poulton, 2018; Sharp et al., 2007), was used as the dependent variable instead of the intensity of mushroom commercialization (Crop Commercialisation Index) for convincing reasons indicated by Gebreselassie and Sharp (2007) that it would be unsuitable to use CCI due to the possibility of misinterpretation. According to Gebreselassie and Sharp (2007), it is impossible to tell when a farmer who produces 100 kg and sells 50 kg of it will record a lower CCI score than the one who produces 5 kg and sells greater part or all of it. Following this reason, Baisa (2009) identified the determinants of crop commericialisation using the value of crop sales as the dependent variable instead of the CCI and employed OLS regression for the estimation. Similarly, Gebreselassie and Sharp (2007) modeled the degree of farmers' tef crop commercialization in Ethiopia using the value of sales as a dependent variable and employed OLS to estimate the same. This was the same for Saha et al. (2021). As a result, for the OLS estimation, the researcher used the total/gross value of mushroom sold (degree of mushroom commercialization) as the dependent variable. Using this dependent variable, mushroom commercialization (degree of mushroom market participation) was defined as the value of mushroom supplied to the market (Poulton, 2018).

Table 29: Multiple linear regression predicting the degree of mushroom commercialisation

Independent variables	Beta	Sig.	VIF
(Constant)	28295.404	.044	
Sex of respondent	-.059	.415	1.114
Age of respondent	.066	.474	1.805
Marital status of respondents	.004	.966	1.884
Educational level	-.055	.441	1.080
Land ownership	.077	.306	1.217
Size of land used for production	.103	.158	1.126
Years of producing mushroom	-.041	.579	1.181
Annual income	.151**	.043	1.180
Production facility (Incubation and cropping rooms)	-.100	.208	1.343
Off farm activities	-.039	.579	1.076
Apply irrigation	-.014	.845	1.070
Access to credit	.069	.329	1.080
Member of farmer association	.044	.568	1.260
Access to extension officer	-.006	.941	1.201
Average price per kg of mushroom	-.078	.331	1.359
Social awareness	-.131	.122	1.510
Market incentive	.071	.330	1.145
Economic value	-.232***	.005	1.426
Institutional constraints and Personal weaknesses	-.002	.976	1.220
Value chain challenge	-.126*	.087	1.138
Market uncertainty	-.106	.181	1.323
Hired labour	.545***	.000	1.247
R Squared	0.408		
Adjusted R Squared	0.306		
F Statistic	3.983***		
***p < 0.01, p < **0.05, p < *0.10			

Source: Field Data (2021).

Y = Degree of mushroom commercialization

Y = 28295.404, if $X_8 = X_{18} = X_{20} = X_{22} = 0$

Y = 28295.404 + 0.151 X_8 - 0.232 X_{18} - 0.123 X_{20} + 0.545X_{22}

The multiple linear regression analytical tool was used to provide insight into the predictors of the degree of mushroom commercialisation (R Squared = 0.408). To uncover any potential misspecification concerns in the estimated model, a diagnostic test for multicollinearity was performed using the variance inflation factor (VIF). When such issue occurs, estimates become unstable and have huge standard errors, resulting in the explanatory variables becoming insignificant for most or all of them. The test revealed that the model's biggest VIF was 1.88 (Table 29), which is less than the maximum value of 10 used as a rule of thumb to identify multicollinearity (Pallant, 2016). This means that multicollinearity was not an issue in the model that was estimated which means that the variables used in the model are *independent* enough and fit for the analysis to prevent misspecification and lower significance of variables.

The F statistic value of 3.983 was statistically significant at 1%, showing that the independent variables together explain the degree of mushroom commercialisation. Four out of the twenty-three independent variables significantly predicted the volume of mushroom output sold. The significant determinants of the value of mushroom output sold are the Annual income of farmers, Economic value of mushroom, Value chain challenge and Hired labour, as presented in Table 29. The average quantity of mushroom harvested per year was dropped from the independent variables because it correlated 0.95 with the dependent variable, the Average value of mushroom sold per year, and contributed hugely (94. 5%) to the variation in the dependent variable. Such correlation is regarded as an indication of multicollinearity and that the dependent variable must be dropped (Pallant, 2016).

Mushroom farmers' annual income from both non-farm activities and farm activities had a positive association with the value of sales of mushroom output and was statistically significant at 5%. From the result, a GHC 1.00 increase in annual income from non-farm activities increases the value of mushroom sales by 15.1%. According to Gebreselassie and Sharp (2007) income that farmers earn from non-farm activities helps them to sell food crops because they know that they have the cash to enable them to buy food when they need them, and so will sell more farm output. Following this, the result implies that mushroom producers' annual income from non-farm activities enables them to sell more mushroom outputs. The results may mean that farmers with higher annual income can invest to expand their production capacity as observed by (Abu, 2015).

Economic value was found to be negatively associated with the degree of mushroom commercialisation at a statistical significance level of 1%. The result indicates that the more economically valuable farmers perceive mushroom, the lower the degree of commercialisation by 23.3%. inherent in the economic value of mushroom is the fact that it is perceived as being able to contribute to food security. This may mean that producers may want to use mushroom as a source of food and consume a substantial amount of the mushroom they produce. Owing to this reason, the amount of mushroom supplied to the market will reduce, which will result in a reduced degree of mushroom commercialisation.

The result bears with Biasa (2009) who found out that households whose major aim for producing all crops supplied only about 22.6% of those crops to

the market and consumed the rest. The study's results, therefore, imply that the more economically valuable farmers perceive mushrooms to be, the more of their mushroom output they will consume which will cause them to supply lower volumes of mushroom to the market, resulting in a lower degree of commercialization.

Value chain challenge was found to have a negative correlation with the degree of commercialisation and was statistically significant at the 10% level. The value chain challenge is explained by two variables: current consumers are limited in their utilization of mushroom and farmers' inability to get access to organisations involved in the processing of mushroom. The existence of processing industries helps fresh mushrooms to be processed and preserved, as well as increases the forms in which mushrooms can be consumed. The finding is in congruence with Ahenkan and Boon (2010) that the lack of processing facilities hinders the commercialization of non-timber forest products in the Western region of Ghana. The result, therefore, implies that the fewer consumers use mushrooms, the less they may demand mushroom, which in turn will cause farmers to supply fewer mushrooms to the market, resulting in a lower degree of commercialization.

Hired labour was statistically significant at the 1% level, and it was positively associated with the degree of commercialisation. Viewing the result in Table 28, 1 person increase in hired labour will result in a 54.5% increase in the degree of mushroom commercialisation. The finding agrees with Mabuza et al. (2013) that households having a relatively larger labour size (endowment) also have a greater likelihood of making a higher labour contribution towards

mushroom enterprise which, all other things being equal, should result in higher production capacity and the volume or value of mushroom sold (degree of commercialisation). The finding of this study is true because according to Oei, (1991), mushroom production is labour-intensive, and therefore to supply more mushroom to the market, farmers need to increase labour to increase production. The result, therefore, implies that an increase in labour will increase the degree of mushroom commercialisation.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This section summarises the results, presents the conclusions and recommendations from the research and provides suggestions for further research, in the foregoing paragraphs:

5.2 Summary

The economic importance of mushroom, coupled with the potential of its production and commercialisation to contribute to livelihoods necessitated its introduction in Ghana in 1993. The National Mushroom Development Project, now the Mushroom Unit of the CSIR-FRI, was subsequently established to promote mushroom production and commercialisation in Ghana. However, for mushroom, like any other economic crop, to be produced at a commercial level, it is important to understand the factors that influence its commercialisation. The study, therefore, identified the determinants of mushroom commercialisation among smallholder producers in the Greater Accra region of Ghana.

The study employed a cross-sectional survey design to collect data from 153 mushroom producers drawn from two (2) municipalities in the Greater Accra region who belong to the Mushroom Growers and Exporters Association of Ghana. A census of all the mushroom producers in the study area was taken. The statistical tools used to analyse the data were frequencies, percentages, means, standard deviations, principal component analysis, Garrett ranking and ordinary least square regression.

The study results revealed that the majority of the mushroom producers in the study area were males. Close to one-third of the mushroom producers were youth. The majority of the producers were in their prime and mature working ages. The majority of the farmers were married. The farmers produced an average of 717kg and sold an average of 514kg in a production year. Most of the farmers had access to output market information which were obtained mainly from neighbours. A majority (86.9%) of the farmers produced mushroom on less than 1 acre of land while only 13.1% used land sizes ranging from 1-1.9 acres for producing mushroom. The average land for producing mushroom was 0.49 acres. More than half of the farmers have five years of experience in mushroom production and marketing and all the farmers have formal education with a majority having tertiary education.

The average price per 1 kg of mushroom was GHC 20.00. Also, the majority of the respondents had up to five dependents and hired up to five men on their farms. Most of the farmers have received tertiary education and their main reason for producing mushroom was both for consumption (66%) followed by solely for sale (52%). Almost all the respondents engaged in non-farm activities and close to three-quarters of them owned land. All the farmers applied irrigation, however, only a few (26.8%) used mechanised irrigation whereas the majority (73.2%) used manual irrigation. The majority (84%) of the respondents did not have access to credit, and almost all (94%) of the farmers belonged to a farmer organization. The majority (57%) of the respondents, however, did not have contact with extension officers.

The study revealed that farmers received market information mainly from neighbours. The majority of the farmers (95%) engaged in non-farm activities such as civil service and petty trading, and the majority (58%) also did not have access to extension services.

The majority (45.8%) of the farmers had an annual income in the range of GHS 1000.00 and GHS 10000.00. More than one-quarter (31.4%) of the farmers had annual incomes ranging from GHS 10100.00 to GHS 20000.00, and less than a quarter (16.3%) of them within the annual income range of GHS 20100.00 and GHS 30000.00. About 3% (3.3%) of the farmers' annual income ranged from GHS 30100.00 to GHS 50000.00 whereas a few farmers, 2% and 1.3% had annual incomes below GHS 1000.00 and above GHS 50000.00 respectively.

The study also revealed that all the farmers had mobile phones. The majority of the farmers (94.1%) did not have mechanized incubation room and the majority (98%) also did not have mechanized cropping room.

In a production year, an average of 75% of the mushroom output is sold in the study area, with the remaining 25% being consumed by the farmers. The majority of the farmers sold up to GHC 10000.00 worth of mushroom per year and the average sales was GHC 10202.29 per year. Females produced (GHC 15901.22) and sold (GHC 11278.37) more mushrooms than males who produced GHC 13367.74 worth of mushroom and sold GHC 9695.29 worth mushroom per year; 2%, 3% and 95% of the mushroom producers were catergorised as low, medium and high commercial farmers respectively.

The motivating factors for mushroom commercialisation in the study area were social awareness of mushroom, market incentives for mushroom, and economic value of mushroom whereas the inhibiting factors of mushroom commercialization identified are institutional constraints and personal weakness in the management of mushroom enterprise, value chain challenge and market uncertainty.

The key contributions of CSIR-FRI towards mushroom commercialisation were found to be training on mushroom cultivation technologies and the supply of spawns.

The factors that best predicted the degree of mushroom commercialisation in the study area are household annual income, the economic value of mushroom, value chain challenges in the mushroom industry and hired labour.

5.3 Conclusions

The following conclusions were drawn based on the summary of the study's findings:

1. Mushroom production in the study area is dominated by males and most of the producers are beyond youthful age and are highly educated; the producers also engage in other economic activities and devote relatively large land sizes on average, to mushroom production.
2. Although mushroom producers in the Greater Accra region are highly commercialized, the volume of sales is low, according to CSIR-FRI standards.

3. Mushroom producers in the Greater Accra region are motivated to produce mushroom because there is social awareness of mushroom, market incentives for mushroom and because mushroom is regarded as an economically valuable agricultural commodity.
4. Mushroom producers in the Greater Accra region are unable to produce and sell mushroom on a commercial scale because of institutional constraints and personal weakness, value chain challenge and market uncertainty.
5. The major contributions of CSIR-FRI towards mushroom commercialization in the study area are training on mushroom cultivation technologies and the supply of spawns.
6. The factors that significantly influence the degree of mushroom commercialization in the study area are household annual income, the economic value of mushroom, value chain challenge in the mushroom industry and hired labour.

5.4 Recommendations

Based on the conclusions above, the following recommendations are made:

1. Stakeholders such as NGOs, Development partners and Food Research Institute in the mushroom industry should encourage women, unemployed youth and the informally or less formally educated people to partake in mushroom production.
2. The Mushroom Unit of the CSIR-FRI should invest in researching technologies and favourable environmental conditions necessary to

increase the production of marketable mushroom and disseminate the same to producers.

3. The Mushroom Unit of the CSIR-FIR should collaborate with MoFA to launch strong advocacy aimed to create more social awareness of the economic value of mushroom to enhance mushroom production and commercialisation.
4. The Mushroom Unit of the CSIR-FRI should collaborate with MoFA, and create a marketing hub for mushroom products where producers can send their output for sale at any time. This will also eliminate the market uncertainty challenge which hinders mushroom commercialization. Also, farmers are strongly encouraged to patronize mushroom production and marketing training programmes as well as research good production and marketing practices to boost their mushroom agribusiness management skills to enhance commercialization.
5. Mushroom Unit of the CSIR-FRI should collaborate with MoFA to organize regular training on mushroom production technologies and marketing to equip producers with the requisite science and art of mushroom production to increase marketable yield. Also, the Mushroom Unit of the CSIR-FRI should invest in making inputs such as quality spawn available so that farmers can access quality spawns in the quantity needed at all times.
6. The Commercialisation Department of Mushroom Unit of CSIR-FRI should collaborate with local and internal development partners and NGOs in the mushroom industry to create awareness of the utilization

of mushroom and to establish mushroom processing facilities to process mushroom to enable farmers to supply more mushrooms. Farmers are encouraged to invest a substantial amount of their non-farm income into mushroom production to expand production and increase sales.

5.5 Areas for further study

Based on the findings of the study, the following subsequent investigations are highly recommended for researchers:

1. Factors motivating and inhibiting commercial mushroom production in Ghana using confirmatory factor analysis (CFA) to validate the motivating and inhibiting factors identified and to quantify their magnitude and direction on the degree of mushroom commercialization.
2. Determinants of Ghanaian youth's willingness to participate in commercial mushroom production.

REFERENCES

Abdullah, Rabbi, F., Ahamad, R., Ali, S., Chandio, A. A., Ahmad, W., Ilyas, A., & Din, I. U. (2019). Determinants of commercialization and its impact on the welfare of smallholder rice farmers by using Heckman's two-stage approach. *Journal of the Saudi Society of Agricultural Sciences*, *18*(2), 224–233. https://doi.org/10.1016/j.jssas.2017.06.001

Abu, B. M. (2015). Groundnut Market Participation in the Upper West Region of Ghana. *Ghana Journal of Development Studies*, *12*(1–2), 106. https://doi.org/10.4314/gjds.v12i1-2.7

Adeniran, A., Ishaku, J., & Yusuf, A. (2020). Youth Employment and Labor Market Vulnerability in Ghana: Aggregate Trends and Determinants. In M. L. McLean (Ed.), *West African Youth Challenges and Opportunity Pathways* (pp. 187–211). Springer International Publishing. https://doi.org/10.1007/978-3-030-21092-2_9

Adjei-Nsiah, S. (n.d.). *Home—Global yield gap atlas*. Global Yield Gap Atlas. Retrieved May 23, 2021, from https://www.yieldgap.org/home

Adu-Gyamerah, E. (2019, May 14). Mushroom production to improve livelihoods. *Graphic Business Online*. https://www.graphicbusinesson line.com/agric/mushroom-production-to-improve-livelihoods

Agwu, N. M., Anyanwu, C. I., & Mendie, E. I. (2013). Socio-Economic Determinants of Commercialization Among Smallholder Farmers in Abia State , Nigeria. *4th Nternational Conference of the African Association of Agricultural Economists*, *January 2012*.

Agyeman, S. E. (2019). *Adoption of Oyster Mushroom Production among Beneficiaries of the Promush Project in the Adentan Municipality of Ghana.* [PhD Thesis]. University of Ghana.

Ahenkan, A., & Boon, E. (2008). Enhancing food security, poverty reduction and sustainable forest management in Ghana through non-timber forest products farming: Case study of Sefwi Wiawso District. *Case Study of Sefwi Wiawso District. Available Online At< Http://Www. Grin. Com/de/Preview/. Html*.

Ahenkan, A., & Boon, E. (2010). Commercialization of non-timber forest products in Ghana: Processing, packaging and marketing. *Journal of Food, Agriculture and Environment*, *8*(2), 962–969.

Ahenkora, K. (2016). Qualitative Value Chain Analysis and Strategic Choices. *J. Buss. Mgt. Eco. Res.*, *3*(1), 429–431.

Ahenkora, K., Yarhands, A. D., & Banahene, S. (2013). Agribusiness Strategy: Adding Value to the Mushroom Value Chain. *International Journal of Technology and Mangement Research*, *1*(2), 76–83.

Akpotosu, B. W. (2015). *Competencies of agricultural extension agents in the use of internet for extension delivery in the Eastern Region, Ghana* [PhD Thesis]. University of Cape Coast.

Alene, A. D., Manyong, V. M., Omanya, G., Mignouna, H. D., Bokanga, M., & Odhiambo, G. (2008). Smallholder market participation under transactions costs: Maize supply and fertilizer demand in Kenya. *Food Policy*, *33*(4), 318–328. https://doi.org/10.1016/j.foodpol.2007.12.001

Anchang, K. Y. (2014). Current developments in mushroom biotechnology in sub Saharan Africa. *World Society for Mushroom Biology Mushroom Production (WSMBMP) Bulletin*, *11*.

Angelsen, A., & Wunder, S. (2003). Exploring the forest-poverty link. *CIFOR Occasional Paper*, *40*, 1–20.

Apetorgbor, M. M., Apetorgbor, A. K., & Nutakor, E. (2005). Utilization and cultivation of edible mushrooms for rural livelihood in Southern Ghana. *17th Commonwealth Forestry Conference, Colombo, Sri Lanka*, *10*.

Arnold, J. M., & Pérez, M. R. (2001). Can non-timber forest products match tropical forest conservation and development objectives? *Ecological Economics*, *39*(3), 437–447.

Asfaw, S., Shiferaw, B., & Simtowe, F. (2010). *Does Technology Adoption Promote Commercialization? Evidence from Chickpea Technologies in Ethiopia*.

Atteh, O. D. (1985). The effect of land tenure systems on agricultural production: A case study of the land tenancy system in the Okun Area of Kwara State, Nigeria. *Geoforum*, *16*(3), 277–286. https://doi.org /10.1016/0016-7185(85)90035-1

Azzari, V., & Pelissari, A. (2021). Does Brand Awareness Influences Purchase Intention? The Mediation Role of Brand Equity Dimensions. *BBR. Brazilian Business Review*, *17*, 669–685.

Baisa, G. A. (2009). Master Thesis Commercialization of Smallholder Farming: Determinants and Welfare Outcomes By Goitom Abera. *Master Thesis*

Commercialization of Smallholder Farming : Determinants and Welfare Outcomes By Goitom Abera, *May*.

Balabanova, B., Stafilov, T., & Baceva, K. (2015). *Application of Principal Component Analysis in The Assessment Of Essential And Toxic Metals In Vegetable And Soil From Polluted And Referent Areas*. 9.

Banerjee, A., & Chaudhury, S. (2010). Statistics without tears: Populations and samples. *Industrial Psychiatry Journal*, *19*(1), 60.

Bao, X., & DUAN Fei-zhou, G. J. (2006). The application of principal component analysis to agriculture soil contamination assessment. 地理研究, *25*(5), 836–842. https://doi.org/10.11821/yj2006050009

Barney, D. . L. (1973a). Growing Mushroom Commercially-Risks and Opportunities. *Electronics and Power*, *19*(11), 248–248. https://doi.org/10.1049/ep.1973.0318

Barrett, C. B. (2008). Smallholder market participation: Concepts and evidence from eastern and southern Africa. *Food Policy*, *33*(4), 299–317. https://doi.org/10.1016/j.foodpol.2007.10.005

Baruch, Y. (1999). Response rate in academic studies-A comparative analysis. *Human Relations*, *52*(4), 421–438.

Bento, C. (2020, October 13). *Principal Component Analysis algorithm in Real-Life: Discovering patterns in a real-estate dataset*. Medium. https://towardsdatascience.com/principal-component-analysis-algorithm-in-real-life-discovering-patterns-in-a-real-estate-dataset-18134c57ffe7

Bernard, T., & Spielman, D. J. (2009). Reaching the rural poor through rural producer organizations? A study of agricultural marketing cooperatives in Ethiopia. *Food Policy*, *34*(1), 60–69.

Bosscher, R. J., & Smit, J. H. (1998). Confirmatory factor analysis of the general self-efficacy scale. *Behaviour Research and Therapy*, *36*(3), 339–343.

Boughton, D., Mather, D., Barrett, C., Benfica, R., Abdula, D., Tschirley, D., & Cunguara, B. (2011). Market Participation by Rural Households in a Low-Income Country: An Asset-Based Approach Applied to Mozambique. *Faith Econ.*, *50*.

Boussard, J.-M. (1992). *The impact of structural adjustment on smallholders*. Rome: Food & Agriculture Org

Briggs, S. R., & Cheek, J. M. (1986). The role of factor analysis in the development and evaluation of personality scales. *Journal of Personality*, *54*(1), 106–148.

Bryman, A., & Cramer, D. (1990). Data analysis and the research process. *Quantitative Data Analysis for Social Scientists. Routledge, London*, 1–15.

Buerke, A., Straatmann, T., Lin-Hi, N., & Müller, K. (2017). Consumer awareness and sustainability-focused value orientation as motivating factors of responsible consumer behavior. *Review of Managerial Science*, *11*(4), 959–991.

BUSAC Report. (2019). *Enhancing the Capacity of the Private Sector With Business Development Services Foreword By the Fund Manager*.

Carletto, C., Corral, P., & Guelfi, A. (2017a). *Agricultural Commercialization and Nutrition Revisited*.

Carletto, C., Corral, P., & Guelfi, A. (2017b). Agricultural commercialization and nutrition revisited: Empirical evidence from three African countries. *Food Policy*, *67*, 106–118.

Carmines, E. G., & Zeller, R. A. (1979). *Reliability and validity assessment*. New York: Sage publications.

Cazzuffi, C., & Mckay, A. (2012). Rice market participation and channels of sale in rural Vietnam. *Selected Paper Prepared for Presentation at the International Association of Agricultural Economists (IAAE) Triennial Conference, Foz, January 2012*, 18–24.

Chamberlin, J. (2007). Defining Smallholder Agriculture in Ghana: Who Are Smallholders , What Do They Do and How Are They Linked With Markets ? In *Ghana Strategy Support Program (GSSP) Background Paper No. GSSP 0006*.

Chang, S. T. (2005). Witnessing the development of the mushroom industry in China. *Acta Edulis Fungi*, *12*(Suppl.), 3–19.

Chang, S. T., & Wasser, S. P. (2017). The cultivation and environmental impact of mushrooms. In *Oxford Research Encyclopedia of Environmental Science*.

Chipande, G. H. R. (1987). Innovation adoption among female-headed households: The case of Malawi. *Development and Change*, *18*(2), 315–327.

Chuwa, P. C., Kivaisi, A. K., & Srivastava, V. (1996). Suitability of organic fraction of market waste for cultivation of edible mushrooms: Coprinus cinereus (Schaeffer: Fr) SF Gray and Pleurotus sajor-caju (Fr.) Singer. *Proceedings of the First Regional Conference on The Impact of Microbiology on Socio-Economic Development and Environment in Sub-Saharan Africa. Dar Es Salaam*.

Cohen, L., Manion, L., & Morrison, K. (2007). Research Methods in Education. In *Routledge*. https://doi.org/10.4324/9781315456539

Cohen, P., West, S. G., & Aiken, L. S. (2014). *Applied multiple regression/correlation analysis for the behavioral sciences*. New York: Psychology press.

Çokluk, Ö., & Koçak, D. (2016). Using Horn's Parallel Analysis Method in Exploratory Factor Analysis for Determining the Number of Factors. *Educational Sciences: Theory and Practice*, *16*(2), 537–551.

Costello, A., & Osborne, J. (2019). Best practices in exploratory factor analysis: Four recommendations for getting the most from your analysis. *Practical Assessment, Research, and Evaluation*, *10*(1). https://doi.org/10.7275/jyj1-4868

Damianos, D., & Skuras, D. (1996). Farm business and the development of alternative farm enterprises: An empirical analysis in Greece. *Journal of Rural Studies*, *12*(3), 273–283.

Darfour, B., & Rosentrater, K. A. (2016). Agriculture and food security in Ghana. *2016 ASABE Annual International Meeting*, 1.

Dhanavandan, S. (2016). Application of Garret Ranking Technique: Practical Approach. *International Journal of Library and Information Studies*, *6*(3), 135–140.

Dixon, J. (ed), Taniguchi, K. (ed), Wattenbach, H. (ed), & Tanyeri-Arbur, A. (ed). (2004). Smallholders, globalization and policy analysis. *Agricultural Management, Marketing and Finance Occasional Paper (FAO)*. https://agris.fao.org/agris-search/search.do? recordID= XF200 8435937

Doss, C. R., & Morris, M. L. (2000). How does gender affect the adoption of agricultural innovations? The case of improved maize technology in Ghana. *Agricultural Economics*, *25*(1), 27–39.

Dupraz, P., & Latruffe, L. (2015). Trends in family labour, hired labour and contract work on French field crop farms: The role of the Common Agricultural Policy. *Food Policy*, *51*, 104–118. https://doi.org/10.10 16/j.foodpol.2015.01.003

Dzomeku, M. (2021). *Peronal Communication*.

Ekaboir, J., Boa, K., & Dankyi, A. A. (2002). Impact of No-Till Technologies in Ghana. In *CIMMYT Economics Program Paper* (Issue May). CIMMYT.

FAO. (2017). *The future of food and agriculture: Trends and challenges. Fao*.

Farmar-Bowers, Q., & Lane, R. (2009). Understanding farmers' strategic decision-making processes and the implications for biodiversity conservation policy. *Journal of Environmental Management*, *90*(2), 1135–1144. https://doi.org/10.1016/j.jenvman.2008.05.002

Ferchak, J., & Croucher, J. (1993). *Prospects and Problems in Commercialization of Small Scale Mushroom Production in South and Southeast Asia*.

Field, A. (2013). *Discovering statistics using IBM SPSS statistics*. London, UK: Sage.

Finkelshtain, I., & Chalfant, J. A. (1991). Marketed Surplus under Risk: Do Peasants Agree with Sandmo? *American Journal of Agricultural Economics*, *73*(3), 557–567. https://doi.org/10.2307/1242809

Foster, A. D., & Rosenzweig, M. R. (1995). Learning by doing and learning from others: Human capital and technical change in agriculture. *Journal of Political Economy*, *103*(6), 1176–1209.

Garrett, H. E. (1981). *Statistics in Psychology and Education. Bombay: Vakils sons*.

Garrett, H. E., & Woodworth, R. S. (1969). Statistics in Psychology and Education (5th Indian edition). *Vakils, Feffer and Simons Private Ltd. Bombay, India*.

Gassner, A., Harris, D., Mausch, K., Terheggen, A., Lopes, C., Finlayson, R., & Dobie, P. (2019). Poverty eradication and food security through agriculture in Africa: Rethinking objectives and entry points. *Outlook on Agriculture*, *48*(4), 309–315. https://doi.org/10.1177/0030727019888513

Gateri, M. W., Muriuki, A. W., Waiganjo, M. W., & Ngeli, P. (2009). Cultivation and Commercialization of Edible Mushrooms in Kenya: A Review of Prospects and Challenges for Smallholder Production. *Acta*

Horticulturae, *806*, 473–480. https://doi.org/10.17660/actahortic.2009.806.59

Gautam, S., Schreinemachers, P., Uddin, M., & Ramasamy, S. (2017). Impact of training vegetable farmers in Bangladesh in integrated pest management (IPM). *Crop Protection*, *102*, 161–169. https://doi.org/10.1016/j.cropro.2017.08.022

Gebremedhin, B., & Jaleta, M. (2010). *Commercialization of smallholders: Does market orientation translate into market participation? 22*, 1–30.

Gebreselassie, S., & Sharp, K. (2007). Commercialisation of smallholder agriculture in selected Tef-growing areas of Ethiopia. *Ethiopian Journal of Economics*, *16*(1), 55–86.

Gebreselassie, S., & Sharp, K. (2008). Commercialisation Of Smallholder Agriculture In Selected Tef-Growing Areas Of Ethiopia. *Ethiopian Journal of Economics*, *16*(1), 55–86. https://doi.org/10.4314/eje.v16i1.39824

Ghadim, A. A., & Pannell, D. (1999). A conceptual framework of adoption of an agricultural innovation. *Agricultural Economics*, *21*, 145–154. https://doi.org/10.1016/S0169-5150(99)00023-7

Ghana_2010_National_Youth_Policy.pdf. (n.d.).

Gifford, R., & Nilsson, A. (2014). Personal and social factors that influence pro-environmental concern and behaviour: A review. *International Journal of Psychology: Journal International De Psychologie*, *49*(3), 141–157. https://doi.org/10.1002/ijop.12034

Gliem, J. A., & Gliem, R. R. (2003). *Calculating, interpreting, and reporting Cronbach's alpha reliability coefficient for Likert-type scales*.

Gniazdowski, Z. (2021). Principal Component Analysis versus Factor Analysis. *Zeszyty Naukowe Warszawskiej Wyższej Szkoły Informatyki*, *15*, 35–88. https://doi.org/10.26348/znwwsi.24.35

Goletti, F., Purcell, T., & Smith, D. (2003). *Agrifood Consulting International Agrifood Discussion Paper Series Concepts of Commercialization and Agricultural Development Concepts of Commercialization and Agricultural Development*. www.agrifoodconsulting.com

Goshu, D., Kassa, B., & Ketema, M. (2012). Measuring Smallholder Commercialization Decisions and Interactions in Ethiopia. *Journal of Economics and Sustainable Development*, *3*(13), 150. https://www.iiste.org/Journals/index .php/JEDS/article/view/3501

Govereh, J., & Jayne, T. S. (2003). Cash cropping and food crop productivity: Synergies or trade-offs? *Agricultural Economics*, *28*(1), 39–50. https://doi.org/10.1111/j.1574-0862.2003.tb00133.x

Govereh, J., Jayne, T. S., & Nyoro, J. (1999). *Smallholder Commercialization , Interlinked Markets and Food Crop Productivity: Cross-Country*

Greiner, R., & Gregg, D. (2011). Farmers' intrinsic motivations, barriers to the adoption of conservation practices and effectiveness of policy instruments: Empirical evidence from northern Australia. *Land Use Policy*, *28*(1), 257–265.

Grimm, D., & Wösten, H. A. B. (2018). Mushroom cultivation in the circular economy. *Applied Microbiology and Biotechnology*, *102*(18), 7795–7803. https://doi.org/10.1007/s00253-018-9226-8

Guillamón, E., García-Lafuente, A., Lozano, M., Rostagno, M. A., Villares, A., & Martínez, J. A. (2010). Edible mushrooms: Role in the prevention of cardiovascular diseases. *Fitoterapia*, *81*(7), 715–723.

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2014). *Multivariate Data Analysis Joseph F. Hair Jr. William C. Black Barry J. Babin Rolph E. Anderson Seventh Edition*.

Hazell, P., & Rahman, A. (2014). Concluding chapter: The policy agenda. *New Directions for Smallholder Agriculture*, 527–558.

Hendricks, F., & Fraser, G. (2003). Obstacles to agricultural development in the communal areas of the Eastern Cape. *A Report for the Eastern Cape Provincial Growth and Development Plan Http://Www. Fao. Org/Ag/AGP/Agpc/Doc/Counprof/Southafrica/Southafrica. Htm*, *4*.

Hichaambwa, M., & Jayne, T. S. (2012). Smallholder Commercialization Trends as Affected by Land Constraints in Zambia: What Are the Policy Implications? In *Food Security Collaborative Policy Briefs* (No. 123211; Food Security Collaborative Policy Briefs). Michigan State University, Department of Agricultural, Food, and Resource Economics. https://ideas.repec.org/p/ags/midcpb/123211.html

Higgins, C., Margot, H., Warnquist, S., Obeysekare, E., & Mehta, K. (2017). Mushroom cultivation in the developing world: A comparison of cultivation technologies. *GHTC 2017 - IEEE Global Humanitarian*

Technology Conference, Proceedings, 1–7. https://doi.org/10.1109/GHTC.2017.8239314

Hutcheson, G. D. (2011). *Ordinary least-squares regression*. Los Angeles: Sage.

Isaya, E. L., Agunga, R., & Sanga, C. A. (2018). Sources of agricultural information for women farmers in Tanzania. *Information Development*, *34*(1), 77–89.

Jaleta, M., Gebremedhin, B., & Hoekstra, D. (2009). *Smallholder commercialization: Processes, determinants and impact*. 55.

Jiang, Y., House, L., Tejera, C., & Percival, S. S. (2015). *Consumption of Mushrooms: A double-hurdle Approach*.

Johnson, D. G. (2017). China's Grain Trade: Some Policy Considerations. In *Agricultural Trade and Policy in China* (pp. 41–52). New York: Routledge.

Jolliffe, I. T. (Ed.). (2002). Principal Component Analysis for Special Types of Data. In *Principal Component Analysis* (pp. 338–372). New York: Springer. https://doi.org/10.1007/0-387-22440-8_13

Jolliffe, I. T., & Cadima, J. (2016). Principal component analysis: A review and recent developments. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*, *374*(2065), 20150202. https://doi.org/10.1098/rsta.2015.0202

Kabacoff, R. I. (2015). *R in action: Data analysis and graphics with R*. Simon and Schuster.

Kabiti, H. M., Raidimi, N. E., Pfumayaramba, T. K., & Chauke1, P. K. (2016). Determinants of Agricultural Commercialization among Smallholder Farmers in Munyati Resettlement Area, Chikomba District, Zimbabwe. *Journal of Human Ecology*, *53*(1), 10–19. https://doi.org/10.1080/09709274.2016.11906951

Kakeya, M., & Sugiyama, Y. (1987). Agricultural change and its mechanism in the Bemba villages of northeastern Zambia. *African Study Monographs. Supplementary Issue.*, *6*, 1–13.

Kankam, B. (2010). *Ghanaian teacher trainees' perception of the official social studies curriculum and the resources available for its implementation*.

Key, N., Sadoulet, E., & Janvry, A. D. (2000). Transactions Costs and Agricultural Household Supply Response. *American Journal of Agricultural Economics*, *82*(2), 245–259. https://doi.org/10.1111/0002-9092.00022

Kherallah, M., & Kirsten, J. (2001). The New Institutional Economics : Applications for Agricultural Policy Research In MSSD Discussion Paper No. 41 by Mylène Kherallah and Johann Kirsten Contact: Shirley Raymundo. *MSSD Discussion Paper No . 41*, *41*.

Kirsten, J. F., & Van Zyl, J. (1998). Defining small-scale farmers in the South African context. *Agrekon*, *37*(4), 551–562.

Kirsten, J., May, J., Hendriks, S., Lyne, M., Machete, C., & Punt, C. (2003). The poverty and food security role of agriculture. *Roles of Agriculture International Conference*, 22–23.

Kivaisi, A. K., Magingo, F. S. S., & Mamiro, B. (2003). Performance of Pleurotus flabellatus on water hyacinth (Eichhornia crassipes) shoots at two different temperature and relative humidity regimes. *Tanzania Journal of Science*, *29*(2), 11–18.

Kortei, N. K., Odamtten, G. T., Obodai, M., Wiafe-Kwagyan, M., & Prempeh, J. (2018). Survey of mushroom consumption and the possible use of gamma irradiation for sterilization of compost for its cultivation in Southern Ghana. *Agriculture and Food Security*, *7*(1), 1–7. https://doi.org/10.1186/s40066-018-0235-8

Kubi, E. K. (2010, October 28). Farmers Forum With Kubi: Mushrooms, Ghana's Hidden Economic Potential. *Farmers Forum With Kubi*. http://farmersforumwithkubi.blogspot.com/2010/10/mushrooms-ghanas-hidden-economic.html

Lavrakas, P. J. (2008). *Encyclopedia of survey research methods*. Sage publications.

Lawler, E., & Porter, L. (2009). Motivation and management Vroom's expectancy theory. *Value Based Management Website*.

Leavy, J., & Poulton, C. (2008). Commercialisations In Agriculture. *Ethiopian Journal of Economics*, *16*. https://doi.org/10.4314/eje.v16i1.39822

Leavy, J., Poulton, C., & Poulton, C. (2008). Commercialisations In Agriculture. *Ethiopian Journal of Economics*, *16*(1). https://doi.org/10.4314/eje.v16i1.39822

Levin, K. A. (2006). Study design III: Cross-sectional studies. *Evidence-Based Dentistry*, *7*(1), 24–25. https://doi.org/10.1038/sj.ebd.6400375

Li, M., & Hu, J. (2014). Study on survival strategies of farmers engage in small-scale household cultivation of edible mushrooms: Take Shandong Province as an example. *Modern Economy*, *5*(12), 1092.

Lomotey, D. S. (2019, July 14). *The success of Benyglad Mushroom Farm*. ActionAid Ghana. https://ghana.actionaid.org/stories/2019/success-benyglad-mushroom-farm

Mabuza, M. L., Ortmann, G. F., & Wale, E. (2012). Determinants of farmers participation in oyster mushroom production in Swaziland: Implications for promoting a non-conventional agricultural enterprise. *Agrekon*, *51*(4), 19–40. https://doi.org/10.1080/03031853.2012.741203

Mabuza, M. L., Ortmann, G. F., & Wale, E. (2013). Socio-economic and institutional factors constraining participation of Swaziland's mushroom producers in mainstream markets: An application of the value chain approach. *Agrekon*, *52*(4), 89–112. https://doi.org/10.1080/03031853.2013.847037

Marshall, E., Newton, A. C., & Schreckenberg, K. (2003). Commercialisation of non-timber forest products: First steps in analysing the factors influencing success. *International Forestry Review*, *5*(2), 128–137.

Martey, E., Al-hassan, R. M., & Kuwornu, J. K. M. (2012). Commercialization of smallholder agriculture in Ghana: A Tobit regression analysis. *African Journal of Agricultural Research*, *7*(14), 2131–2141. https://doi.org/10.5897/AJAR11.1743

Masnan, M. J., Zakaria, A., Shakaff, A. Y. M., Mahat, N. I., Hamid, H., Subari, N., & Saleh, J. M. (2012). Principal Component Analysis–A Realization

of Classification Success in Multi Sensor Data Fusion. *Principal Component Analysis Application*, 1–25.

Mellon-Bedi, S., Descheemaeker, K., Hundie-Kotu, B., Frimpong, S., Groot, J. C. J., Frimpongc, S., & Groot, J. C. J. (2020). Motivational factors influencing farming practices in northern Ghana. *NJAS - Wageningen Journal of Life Sciences*, *92*(February), 100326. https://doi.org/10.1016/j.njas.2020.100326

Miles, P. G., & Chang, S.-T. (2004). *Mushrooms: Cultivation, Nutritional Value, Medicinal Effect, and Environmental Impact* (2nd edition). CRC Press.

MoFA. (2007). *Food and Agriculture Sector Development Policy (FASDEP II)*.

MOFA. (2011). Agriculture in Ghana Facts and Figures (2010). *Statistics Research and Information Directorate -SRID, Accra, Ghana*, 53.

Mshandete, A. M. (1998). *Taxonomy, cultivation and nutritional value of some local edible mushrooms* [PhD Thesis]. MSc Thesis, University of Dar es Salaam.

Muijs, D. (2004). Introduction to quantitative research. *Doing Quantitative Research in Education with SPSS*, 1–12.

Muijs, D. (2010). *Doing quantitative research in education with SPSS*. Sage.

Mushroom – PO – Ghana. (2017). *Mushroom – PO – Ghana*. https://www.2scale.org/fr/past-partnerships/mushroom-po-ghana-fr

Mutema, M., Basira, K., Savadye, D., & Parawira, W. (2019). Assessment of oyster mushroom production and profitability in harare urban and

periurban areas (RUWA), Zimbabwe. *Tanzania Journal of Science*, *45*(1), 114–130.

Mzali, S. (2020, December 4). *Report: How has Ghana responded to the Covid-19 pandemic?* Oxford Business Group. https://oxfordbusinessgroup.com/blog/souhir-mzali/focus-reports/report-how-has-ghana-responded-covid-19-pandemic

Nakano, Y., Tsusaka, T. W., Aida, T., & Pede, V. O. (2018). Is farmer-to-farmer extension effective? The impact of training on technology adoption and rice farming productivity in Tanzania. *World Development*, *105*, 336–351.

Ndem, J. U., & Oku Martha, O. (2016). Mushroom production for food security in Nigeria. *Food Science and Quality Management*, *48*, 44–50.

Nepal, R., & Thapa, G. (2009). Determinants of Agricultural Commercialization and Mechanization in the Hinterland of a City in Nepal. *Applied Geography*, *29*, 377–389. https://doi.org/10.1016/j.apgeog.2008.12.002

Nevid, J. S. (2012). *Psychology: Concepts and Applications*. Cengage Learning.

Newton, A., Schreckenberg, K., & Marshall, E. (2006). *Commercialisation of Non-Timber Forest Products: Factors Influencing Success. Lessons Learned from Mexico and Bolivia and Policy Implications for Decision-Makers*. https://doi.org/10.1505/ifor.8.3.368

North, D. C. (1992). *Institutions, institutional change and economic performance*. JSTOR.

Nugrahadi, E. W., Maipita, I., & Situmeang, C. (2020). Dominant Socio-Economic Indicators on the Growth of Small-Scale Industrial Sector: Empirical Evidence with Principal Component Analysis. *Revista Espacios*, *41*(01).

Nunnally, J. C. (1978). *Psychometric Theory: 2d Ed*. McGraw-Hill.

Nwafor, C. U., & van der Westhuizen, C. (2020). Prospects for Commercialization among Smallholder Farmers in South Africa: A Case Study. *Journal of Rural Social Sciences*, *35*(1), 2.

Obiadi, A. J., Nwankwo, F. O., Ezeokafor, U. R., & Ekwere, G. E. (2020). The Effect of Institutional Factors in Marketing of Agricultural Products by Cooperative Farmers. *Sumerianz Journal of Agriculture and Veterinary*, *3*(4), 35–45. https://doi.org/10.5430/bmr.v9n1p43

Obodai, M. (2000). Mushroom cultivation in Ghana, FAO Global Network on Mushrooms Newsletter Number 3. In *000/002 Council or Scientific and Industrial Research* (Issue 3).

Obodai, M., Dzomeku, M., Narh Mensah, D., & Takli, R. (2015). *Council for Scientific and Industrial Research-Food Research Institue* (pp. 1–9).

Obodai, M., Ofori, H., Dzomeku, M., Takli, R. K., Komlaga, G. A., Dziedzoave, N. T., Narh Mensah, D. L., Prempeh, J., & Sonnenberg, A. (2014). *Heavy metal and proximate composition associated with the composting of cassava (Manihot esculenta) peels used in the cultivation of mushrooms in Ghana*. https://csirspace.foodresearchgh.site/handle/123456789/338

Oei, P. (1991). *Manual on mushroom cultivation: Techniques, species and opportunities for commercial application in developing countries*. New Dheli: TOOL Publications ; CTA.

Ogutu, S. O., Gödecke, T., & Qaim, M. (2020). Agricultural Commercialisation and Nutrition in Smallholder Farm Households. *Journal of Agricultural Economics*, *71*(2), 534–555. https://doi.org/10.1111/1477-9552.12359

Olwande, J., & Mathenge, M. (2012). Market Participation among Poor Rural Households in Kenya. *International Association of Agricultural Economists (IAAE) Triennial Conference, January 2010*, 1–29.

Omiti, J. M., Otieno, D. J., Nyanamba, T. O., & McCullough, E. B. (2009). Factors influencing the intensity of market participation by smallholder farmers: A case study of rural and peri-urban areas of Kenya. *African Journal of Agricultural and Resource Economics*, *03*(1), 1–26. https://ideas.repec.org/a/ags/afjare/56958.html

Osborne, J. W., & Costello, A. B. (2009). Getting the most from your analysis. *Pan*, *12*(2), 131–146.

Pallant, J. (2013). *SPSS survival manual: A step by step guide to data analysis using IBM SPSS*. New York: Routledge.

Pallant, J. (2016). *Ebook: SPSS Survival Manual*. New York: McGraw-Hill Education (UK).

Pannell, D. J., Marshall, G. R., Barr, N., Curtis, A., Vanclay, F., & Wilkinson, R. (2006). Understanding and promoting adoption of conservation practices by rural landholders. *Australian Journal of Experimental Agriculture*, *46*(11), 1407–1424.

Paul, L. C., Suman, A. A., & Sultan, N. (2013). Methodological analysis of principal component analysis (PCA) method. *International Journal of Computational Engineering & Management*, *16*(2), 32–38.

Paulraj, L., & Francois, B. (1995). *Technical And Economic Aspects Of Producing Mushrooms In The Caribbean*.

Paulsen, J., & BrckaLorenz, A. (2017). *Internal Consistency Statistics*. Faculty Survey of Student Engagement.

Pingali, P., Khwaja, Y., & Meijer, M. (2005). *Commercializing Small Farms: Reducing Transaction Costs*.

Pingali, P. L., & Rosegrant, M. W. (1995a). Agricultural commercialization and diversification: Processes and policies. *Food Policy*, *20*(3), 171–185. https://doi.org/10.1016/0306-9192(95)00012-4

Pingali, P. L., & Rosegrant, M. W. (1995b). Agricultural commercialization and diversification: Processes and policies. *Food Policy*, *20*(3), 171–185. https://doi.org/10.1016/0306-9192(95)00012-4

Ponterotto, J. G. (2005). Qualitative research in counseling psychology: A primer on research paradigms and philosophy of science. *Journal of Counseling Psychology*, *52*(2), 126.

Portier, K. M., Fabi, G., & Darius, P. H. (2000). Study design and data analysis issues. *Artificial Reef Evaluation: With Application to Natural Marine Habitats*, 21–50. https://doi.org/10.1201/9781420036633.ch2

Poulton, C. (2018). *APRA Brief 1: What is Agricultural Commercialisation: Who Benefits and How do we Measure it?*

Poulton, C., Dorward, A., & Kydd, J. (2010). The Future of Small Farms: New Directions for Services, Institutions, and Intermediation. *World Development, 38*(10), 1413–1428. https://doi.org/10.1016/j.worlddev.2009.06.009

Pradhan, K., Dewina, R., & Minten, B. (2010). *"Agricultural Commercialization and Diversification in Bhutan." IFPRI Report Summary. July 2010. Washington, DC: International Food Policy Research Institute—Google Search*. https://www.google.com/search?q=Pradhan%2C+Kailash%2C+Reno+Dewina%2C+and+Bart+Minten.+2010.+%E2%80%9CAgricultural+Commercialization+and+Diversification+in+Bhutan.%E2%80%9D+IFPRI+Report+Summary.+July+2010.+Washington%2C+DC%3A+International+Food+Policy+Research+Institute&oq=Pradhan%2C+Kailash%2C+Reno+Dewina%2C+and+Bart+Minten.+2010.+%E2%80%9CAgricultural+Commercialization+and+Diversification+in+Bhutan.%E2%80%9D+IFPRI+Report+Summary.+July+2010.+Washington%2C+DC%3A+International+Food+Policy+Research+Institute&aqs=chrome..69i57.617j0j7&sourceid=chrome&ie=UTF-8

Prager, K., & Posthumus, H. (2010). Socio-economic factors influencing farmers' adoption of soil conservation practices in Europe. *Human Dimensions of Soil and Water Conservation, 12*, 1–21.

Qaim, M., Ogutu, S. O., & Theda, G. (2020). *Agricultural Commercialisation and Nutrition in Smallholder Farm Households*. *71*(2), 534–555. https://doi.org/10.1111/1477-9552.12359

Randela, R., Alemu, Z., & Groenewald, J. (2008). Factors enhancing market participation by small-scale cotton farmers. *Agrekon*, *47*. https://doi.org/10.1080/03031853.2008.9523810

Randolph, T. F. (1993). *The impact of agricultural commercialization on child nutrition: A case study of smallholder households in Malawi.*

Rapsomanikis, G. (2015). The economic lives of smallholder farmers: An analysis based on household data from nine countries. *Food and Agriculture Organization of the United Nations, Rome*.

Rašper, V. (1969). Investigations on starches from major starch crops grown in Ghana I.—Hot paste viscosity and gel-forming power. *Journal of the Science of Food and Agriculture*, *20*(3), 165–171.

Reilly, A., & Eaves, R. C. (2000). Factor analysis of the Minnesota Infant Development Inventory based on a Hispanic migrant population. *Educational and Psychological Measurement*, *60*(2), 271–285.

Rosmiza, M., Davies, W., Aznie, R. C., Jabil, M., & Mazdi, M. (2016). Prospects for Increasing Commercial Mushroom Production in Malaysia: Challenges and Opportunities. *Mediterranean Journal of Social Sciences*, *7*(1), 406–415. https://doi.org/10.5901/mjss.2016.v7n1s1p406

Roupas, P., Keogh, J., Noakes, M., Margetts, C., & Taylor, P. (2012). The role of edible mushrooms in health: Evaluation of the evidence. *Journal of Functional Foods*, *4*(4), 687–709.

Rühl, M., & Kües, U. (2006). 22. Mushroom Production. *Molecular Wood Biotechnology*, 555–586.

Ryan, R. M., & Deci, E. L. (2000). Intrinsic and Extrinsic Motivations: Classic Definitions and New Directions. *Contemporary Educational Psychology*, *25*(1), 54–67. https://doi.org/10.1006/ceps.1999.1020

Saha, A., Sabates-Wheeler, R., & Thompson, J. (2021). Insights into smallholder capacity for agricultural commercialisation: Evidence from four African contexts. *The European Journal of Development Research*. https://doi.org/10.1057/s41287-021-00414-z

Salkind, N. (2010). *Encyclopedia of Research Design*. SAGE Publications, Inc. https://doi.org/10.4135/9781412961288

Sarff, P. L. (1997). *Using factor replicability to evaluate number of factors rules* [PhD Thesis]. Fuller Theological Seminary, School of Psychology.

Schunko, C., Lechthaler, S., & Vogl, C. R. (2019). Conceptualising the factors that influence the commercialisation of non-timber forest products: The case of wild plant gathering by organic herb farmers in South Tyrol (Italy). *Sustainability*, *11*(7), 2028.

Seyoum, C., Lemma, T., & Karippai, R. S. (2011). Factors Determining the Degree of Commercialization of Smallholder Agriculture: The Case of Potato Growers in Kombolcha District, East Hararghe, Ethiopia. *JAD*, *2*(1), 18–36.

Sharma, S. (1996). *Applied multivariate techniques*. London: Sage.

Sharp, K., Ludi, E., & Gebreselassie, S. (2007). Commercialisation Of Farming In Ethiopia: Which Pathways? *Ethiopian Journal of Economics*, *16*(1), 39–54.

Shem, S. (2018, January 17). Mushroom Farming in Ghana for Beginners. *Yen.Com.Gh - Ghana News*. https://yen.com.gh/104126-commercial-mushroom-farming-ghana-beginners.html

Sher, H. (2006). Ecological and economic evaluation of some Morels Mushroom (Morchella Spp). *Wild Mush*, *33*, 23–44.

Shirur, M., Gowda, N. S., Chandregowda, M. J., & Rana, R. K. (2017). An exemplary story of growing temperate mushroom in tropical climate of rural India: Lessons for other startups. *Indian Journal of Extension Education*, *53*(3), 98–104.

Singh, K. (2000). Education, Technology Adoption and Agricultural Productivity. *Indian Journal of Agricultural Economics*, *55*(3). https://ideas.repec.org/a/ags/inijae/297766.html

Siziba, S., Nyikahadzoi, K., Diagne, A., Fatunbi, A. O., & Adenkule, A. A. (2011). Determinants of cereal market participation by sub-Saharan Africa smallholder farmer. *Learning Publics Journal of Agriculture and Environmental Studies*, *2*(1), 180–193. https://www.researchgate.net/publication/216365595_Determinants_of_cereal_market_participation_by_sub-Saharan_Africa_smallholder_farmers

Stephens, E. C., & Barrett, C. B. (2011). Incomplete Credit Markets and Commodity Marketing Behaviour. *Journal of Agricultural Economics*, *62*(1), 1–24. https://doi.org/10.1111/j.1477-9552.2010.00274.x

Strasberg, P. J., Jayne, T. S., Yamano, T., Nyoro, J. K., Karanja, D. D., & Strauss, J. (1999). *Effects of Agricultural Commercialization on Food Crop Input Use and Productivity in Kenya*.

Straub, D., Boudreau, M.-C., & Gefen, D. (2004). Validation guidelines for IS positivist research. *Communications of the Association for Information Systems*, *13*(1), 24.

Tabachnick, B. G., & Fidell, L. S. (2001). Using multivariate statistics (6e éd.). Boston, É. *U.: Allyn & Bacon*.

Taber, K. S. (2018). The Use of Cronbach's Alpha When Developing and Reporting Research Instruments in Science Education. *Research in Science Education*, *48*(6), 1273–1296. https://doi.org/10.1007/s11165-016-9602-2

Taherdoost, H. (2016). Validity and reliability of the research instrument; how to test the validation of a questionnaire/survey in a research. *How to Test the Validation of a Questionnaire/Survey in a Research (August 10, 2016)*.

Takane, T. (2004). Smallholders and Nontraditional Exports Under Economic Liberalization: The Case of Pineapples in Ghana. *African Study Monographs*, *25*(1), 29–43. https://doi.org/10.14989/68228

te Velde, D. W. (2004). *Successful NTFP commercialisation. A quantitative analysis based on household and trader level data. A final output of project R7925*. GOV.UK. https://www.gov.uk/research-for-development-outputs/successful-ntfp-commercialisation-a-quantitative-analysis-based-on-household-and-trader-level-data-a-final-output-of-project-r7925

Technical Centre for Agricultural and Rural Cooperation. (1992). Mushrooms from Ghana. *Spore*. https://cgspace.cgiar.org/handle/10568/45872

Thilakaratna, S., Trust, B. R., Pathirana, B. M., & Trust, B. R. (2018). Prospects and Challenges of Mushroom Production in Kuruwita , Sri Lanka: Comparative Report on Two Consecutive Years Prospects and Challenges of Mushroom Production in Kuruwita , Sri Lanka: Comparative Report on Two Consecutive Years. *Journal of Dry Zone Agriculture*, *4*(1), 1–7.

Tipraqsa, P., & Schreinemachers, P. (2009). Agricultural commercialization of Karen Hill tribes in northern Thailand. *Agricultural Economics*, *40*(1), 43–53. https://doi.org/10.1111/j.1574-0862.2008.00343.x

Tranquillo, J., & Stecker, M. (2016). Using intrinsic and extrinsic motivation in continuing professional education. *Surgical Neurology International*, *7*(Suppl 7), S197.

Tufa, A., Bekele, A., & Zemedu, L. (2014). Determinants of smallholder commercialization of horticultural crops in Gemechis District, West Hararghe Zone, Ethiopia. *African Journal of Agricultural Research*, *9*(3), 310–319.

Velicer, W. F., Eaton, C. A., & Fava, J. L. (2000). Construct explication through factor or component analysis: A review and evaluation of alternative procedures for determining the number of factors or components. *Problems and Solutions in Human Assessment*, 41–71.

Vermeulen, S., & Cotula, L. (2010). Making the most of agricultural investment: A Survey of Business Models that Provide Opportunites for Smallholders. In *Survey of Business*. IIED/FAO/IFAD/SDC.

von Braun, J. (1995). Agricultural commercialization: Impacts on income and nutrition and implications for policy. *Food Policy*, *20*(3), 187–202. https://doi.org/10.1016/0306-9192(95)00013-5

Von Braun, J., & Kennedy, E. T. (1994). *Agricultural commercialization, economic development, and nutrition*. Published for the International Food Policy Research Institute [by] Johns Hopkins University Press. https://agris.fao.org/agris-search/search.do?recordID=US201300304938

von Braun, J., & Kennedy, E. T. (1994). *Agricultural commercialization, economic development, and nutrition*. https://ebrary.ifpri.org/digital/collection/p15738coll2/id/129374

Vroom, V. H. (1964). *Work and motivation*. London: Wiley.

Wang, C.-N., & Weng, L.-J. (2002). Evaluating the use of exploratory factor analysis in Taiwan: 1993-1999. *Chinese Journal of Psychology*, *44*(2), 239–252.

Watt, H. M. G., & Richardson, P. W. (2007). Motivational Factors Influencing Teaching as a Career Choice: Development and Validation of the FIT-Choice Scale. *The Journal of Experimental Education*, *75*(3), 167–202. https://doi.org/10.3200/JEXE.75.3.167-202

Weatherspoon, D. D., & Reardon, T. (2003). The rise of supermarkets in Africa: Implications for agrifoods systems and the rural poor. *Development Policy Review*, *21*(3), 333–355. https://doi.org/10.1111/1467-7679.00214

Williams, M. N., Grajales, C. A. G., & Kurkiewicz, D. (2013). Assumptions of multiple regression: Correcting two misconceptions. *Practical Assessment, Research, and Evaluation*, *18*(1), 11.

Williamson, O. E. (2000). The new institutional economics: Taking stock, looking ahead. *Journal of Economic Literature*, *38*(3), 595–613. https://doi.org/10.1257/jel.38.3.595

Word Vision International. (2021). *Why Food Security?* https://www.wvi.org /ghana/our-work/why-food-security

Workineh, N., & Roth, M. (2006). Intensification and crop commercialization in Northeastern Ethiopia. *Ethiopian Journal of Economics*, *11*(2), 105–105. https://ideas.repec.org/a/ags/eeaeje/249850.html

World Bank. (2007). *World Bank Assistance to Agriculture in Sub-Saharan Africa: An IEG Review*. The World Bank.

World Bank. (2008). *The World Bank Annual Report 2008: Year in Review*. World Bank. https://openknowledge.worldbank.org/handle/10986/7524

Worthington, R. L., & Whittaker, T. A. (2006). Scale Development Research: A Content Analysis and Recommendations for Best Practices. *The Counseling Psychologist*, *34*(6), 806–838. https://doi.org/10.1177/00 11000006288127

Yong, A. G., & Pearce, S. (2013). A beginner's guide to factor analysis: Focusing on exploratory factor analysis. *Tutorials in Quantitative Methods for Psychology*, *9*(2), 79–94.

Yoo, B., & Donthu, N. (2001). Developing and validating a multidimensional consumer-based brand equity scale. *Journal of Business Research*, *52*(1), 1–14. https://doi.org/10.1016/S0148-2963(99)00098-3

Zero Emissions Research Initiatives (ZERI). (2015, November 24). *MRC | ZERI*. University of Namibia. https://www.unam.edu.na/mrc/zeri

Zhang, Y., Geng, W., Shen, Y., Wang, Y., & Dai, Y. C. (2014). Edible mushroom cultivation for food security and rural development in China: Bio-innovation, technological dissemination and marketing. *Sustainability (Switzerland)*, *6*(5), 2961–2973. https://doi.org/10.3390/su6052961

Zhou, S., Minde, I., & Mtigwe, B. (2013). *Smallholder agricultural commercialization for income growth and poverty alleviation in southern Africa: A review*. https://doi.org/10.5897/AJAR11.1040

APPENDICES

APPENDIX A: GARRETT RANKING CONVERSION TABLE

GARRETT RANKING CONVERSION TABLE

The conversion of orders of merits into units of amount of "socres"

Percent	Score	Percent	Score	Percent	Score
0.09	99	22.32	65	83.31	31
0.20	98	23.88	64	84.56	30
0.32	97	25.48	63	85.75	29
0.45	96	27.15	62	86.89	28
0.61	95	28.86	61	87.96	27
0.78	94	30.61	60	88.97	26
0.97	93	32.42	59	89.94	25
1.18	92	34.25	58	90.83	24
1.42	91	36.15	57	91.67	23
1.68	90	38.06	56	92.45	22
1.96	89	40.01	55	93.19	21
2.28	88	41.97	54	93.86	20
2.69	87	43.97	53	94.49	19
3.01	86	45.97	52	95.08	18
3.43	85	47.98	51	95.62	17
3.89	84	50.00	50	96.11	16
4.38	83	52.02	49	96.57	15
4.92	82	54.03	48	96.99	14
5.51	81	56.03	47	97.37	13
6.14	80	58.03	46	97.72	12
6.81	79	59.99	45	98.04	11
7.55	78	61.94	44	98.32	10
8.33	77	63.85	43	98.58	9
9.17	76	65.75	42	98.82	8
10.06	75	67.48	41	99.03	7
11.03	74	69.39	40	99.22	6
12.04	73	71.14	39	99.39	5
13.11	72	72.85	38	99.55	4
14.25	71	74.52	37	99.68	3
15.44	70	76.12	36	99.80	2
16.69	69	77.68	35	99.91	1
18.01	68	79.17	34	100.00	0
19.39	67	80.61	33		
20.93	66	81.99	32		

Sorce: Academia.edu

APPENDIX B: STRUCTURED INTERVIEW SCHEDULE

DEPARTMENT OF AGRICULTURAL ECONOMICS AND EXTENSION

COLLEGE OF AGRICULTURE AND NATURAL SCIENCES

UNIVERSITY OF CAPE COAST, CAPE COAST

STRUCTURED INTERVIEW SCHEDULE

This structured interview schedule is to solicit information on the **Determinants of Commercialisation of Mushroom Production among Small-scale Mushroom Farmers in some selected Municipalities in the Greater Accra Region of Ghana**. This questionnaire is an input for the master thesis research purely in pursuit of academic purposes. All information provided will be treated confidential and will be used solely for the study.

Interviewer_____ Date of interview _____/_____/2021

Questionnaire Number _____

Tel. No. of Respondent_____

Name of respondent: _____

SECTION A: HOUSEHOLD DEMOGRAPHIC AND SOCIO-ECONOMIC CHARACTERISTICS

A1 Demographic Characteristics

1. Sex: 1 Male [ ] 0: Female [ ]
2. Please indicate your age at last birthday _____ (in years)
3. Please indicate your marital status
    1. Married [ ]
    1 0. Not Married [ ]
4. Please indicate the number of years you have spent in school:

    _____
5. Please indicate your level of education
    1. Primary School [ ]
    2. Junior High School [ ]
    3. "O" Level [ ]
    4. Senior High School [ ]
    5. "A" Level [ ]
    6. Tertiary [ ]
6. Please indicate the number of dependents (household size)

    _____
7. Please indicate the range of your annual income (in GHS) below:
    1. Less than 1000 [ ]
    2. 1000-10000 [ ]
    3. 3.10100-20000 [ ]
    4. 20100-30000 [ ]
    5. 30100-40000 [ ]
    6. 40100-50000 [ ]
    7. Above 50000 [ ]

A2 Socioeconomic Characteristics

2 A2.1 Farm characteristics

8. Do you own the land you used for mushroom farming last year (2020)?

    1. Yes [ ]
    0. No [ ]

9. If no (**about Q7**)**,** by which means did you acquire the land?

    1. Bought [ ]
    2. Rented [ ]
    3. Inherited [ ]

10. What was the size (in acres) of land you acquired through the method in **Q8** for mushroom production? _____

11. If yes (**about Q7**), have you acquired a **land-use title certificate** from the government?

    1. Yes
    0. No

3 A2.2 Production characteristics

How many years have you been producing mushroom? _____

12. How many times, **on average**, did you produce mushrooms in a year?
    1. Once [ ]
    2. Twice [ ]
    3. Thrice [ ]
    4. More than thrice [ ]
13. What was the average quantity (kg) of mushrooms you harvested last year (2020)? ____
14. What is your primary reason for producing mushrooms?
    1. Own consumption [ ]
    2. Selling to the market [ ]
    3. Partially for consumption and partially to sell to the market [ ]
    4. Other [ ](specify) _____
15. What was the average quantity (kg) of mushroom you sold in year (2020)? _____
16. Do you engage in any non-farm activity?
    1. Yes [ ]

4 0. No [ ]

17. If yes, what were the sources of your non-farm income? Please indicate below:

No.	Tic k	Non-farm income Activity	Amount (GH¢)
1.		Non-farm wage income Civil service [ ]	
2.		Self-employed income: e.g. trading, artisan, carpentry, etc. [ ]	
3.		Livestock [ ]	
4.		Poultry farming [ ]	
5.		Award (s) [ ]	
6.		Others e.g. pension, capital earnings, etc. [ ]	
Total Amount GH¢			

5 A2.3 Farm inputs and Technology

18. Which of the following inputs did you purchase and use in your mushroom production last year (2020)?

S.N	Description		1 Yes 2 No	Qty in kg	Cost (GH¢)
	Fertilizer	Urea			
		NPK			
		Other (specify)			
	Supplement	Epsom salt			
		Wheat/rice bran			
		Quicklime			
		Groundnut testa			
		Sawdust			
		Other (specify)			
	Improved seed	Spawn			

19. How will you assess the cost of the inputs in **Q20**?

    1. Very high [ ]
    2. High [ ]
    3. Moderate [ ]
    4. Low [ ]
    5. Very low [ ]

20. How will you assess the accessibility of the inputs in **Q20**?

    1. Accessible

    6 0. Not accessible

21. What is your source of finance for purchasing the inputs above?

    (**multiple answers possible**)

    1. Own savings [ ]
    2. Credit [ ]
    3. Safety net [ ]
    4. Remittance [ ]
    5. Other [ ](specify) _____

22. If you do not apply any of the inputs above in your farm, what are your reasons? _____

23. Have you been applying irrigation in your production?

    1. Yes [ ]

    7 0. No [ ]

24. If yes (**about Q25**), what sources of irrigation do you use?

    1. Stream/river [ ]
    2. Dam [ ]

3. Borehole [ ]
4. Pipe bone [ ]
5. Other [ ] (specify) _____

25. What kind of irrigation do you use?

1. Mechanised
2. Manual

26. Do you pay for your use of irrigation?

1. Yes [ ]
8 0. No [ ]

27. If yes, how do you rate its affordability?

1. Expensive [ ]
2. Affordable [ ]
3. Cheap [ ]

28. **On average**, how often do you apply irrigation in a year of production?

1. Once [ ]
2. Twice [ ]
3. Thrice [ ]
4. More than thrice [ ]

29. Did you have access to credit/loan for your production last year (2020)?

1. Yes [ ]
9 0. No [ ]

30. If Yes (**about Q30**), how much did you borrow?

_____**(**GH¢)

31. If Yes (**about Q30**), what were your major sources?

1. Savings and loans institutions [ ]
2. Commercial banks [ ]
3. Informal creditors (friends, family, etc.) [ ]
4. Other [ ] (specify) _____

32. What did you do with the borrowed money?

S.N	Activities	1Yes 2 No	Rank according to the degree of expenditure (1= highest, 2= next highest..,etc.)
1	Purchased inputs such as fertilizer, improved seeds, etc		
2	Hired labour		
3	Built cropping house		
4	Other		

33. How do you assess the cost of getting credit?

    1. Expensive [ ]
    2. Affordable [ ]
    3. Cheap [ ]

34. Please indicate the following by ticking (√)

10 Production facility	11 Mechanised 12 Yes	13 No
14 1.Incubation room	15	16
17 2.Cropping house	18	19

20

35. What did the labor composition of your farm look like in the last production year (2020)?

S.N	Participation in farm activities	Number of persons
1.	21 Household head	22
2.	23 Spouse	24
3.	25 Adult women (Age >=18)	
4.	26 Adult men (Age >=18)	27
5.	28 Young girls (13-17)	29
6.	30 Young boys (13-17)	31

32 A2.4 Social capital

36. Are you a member of any farmer association (s) (FBO)?

    1. Yes [ ]

33 0. No [ ]

37. If Yes, what type of association (s) is it?

    1. Savings and Credit Institution **[ ]**
    2. Farmer's Cooperative [ ]
    3. NGO [ ]
    4. Other [ ] (specify)_____

38. How does your membership in the association (s) benefit you?

(**multiple answers possible**)

    1. Fast Input Delivery [ ]
    2. Affordable Input price [ ]
    3. Fair farm gate output prices [ ]
    4. Strong bargaining power [ ]
    5. Reliable storage facility [ ]
    6. Easy access to credit [ ]
    7. Increased Savings Habit [ ]
    8. Other [ ] (Specify)_____

39. If No (**about Q37**), why? _____

34 A2.5 Assets (private) endowment

40. How many of the following assets do you own?

S. N	Asset	Tick	Quantity in unit
	Vehicle (specify)		
	"Aboboyaa"		
	Industrial autoclave		
	Motorcycle		
	Storage facility (specify)		
	Refridgerated van		
	Other (specify)		

A2.6 Access to public services

Do you have access to extension officer (s) from MoFA or CSIR-FRI?

Yes [ ]

0. No [ ]

If Yes, which of the following services do you receive from the extension officer (s)?

S.N	Type of service received	Yes	No
	Technical advice		
	Credit information		
	Quality spawns distribution/information		
	Market information (input and/or output)		
	Capacity building training		

	Weather-related information		
	Supplements /Fertilizer information		
	Other (specify)		

SECTION B: INFRASTRUCTURE AND MARKET INFORMATION

Who is/are the major buyer (s) of your mushrooms? (multiple answers possible)

Rural consumers [ ]

Peri-Urban consumers [ ]

Cooperatives [ ]

Urban consumers [ ]

Middlemen from towns [ ]

Other [ ] (specify) _____

What is the nearest output market (to your farm) where you usually sell your mushroom? _____

What is the nearest town/city (from your farm) where you sell your product? _____

Do you have road access to the nearest town/city where you normally sell your mushrooms?

Yes [ ]

0. No [ ]

If Yes, do you have transport access to the nearest town/city?

Yes [ ]

0. No [ ]

S.N	**Means of accessing Information**	**Have you been using the means?** 1 Yes 2 No	**To which extent do you rely on the means of information?** 1 High 2 Moderate 3 Low	**To which extent do you depend on the sources of information?** 1 High 2 Moderate 3 Low
1.	Government/Extension officers	35	36	37
2.	Television	38	39	40
3.	Radio	41	42	43
4.	Mobile phone	44	45	46
5.	Neigbhours	47	48	49
6.	Personal visits to the market	50	51	52
7.	Traders/middlemen	53	54	55

41. What is the **average price per kg** of mushroom? _____**(**GH¢)

42. How do you acquire market information about output prices?

SECTION C: MOTIVATING FACTORS OF COMMERCIALISATION OF MUSHROOM PRODUCTION

Please, indicate your level of agreement with the following statements about your motivation for going into mushroom farming/producing mushrooms for sale (mushroom commercialization).

5= Very High Agreement (Agree with the statement completely)

4= High Agreement (Agree with the statement to a higher degree but not completely)

3= Moderate Agreement (Agree with the statement partially or in part)

2= Low Agreement (Agree with the statement to a small degree)

1= Very Low Agreement (Agree with the state to the lowest degree)

56

43.

Motivators for commercial mushroom production		**Level of agreement**				
		1	**2**	**3**	**4**	**5**
1	I can grow mushrooms at any time of the year.					
2	Production inputs are readily available in and around my community.					
3	I can easily access mechanized services in and around my community for incubation and cropping.					

4	There is a more secure market for mushrooms.					
5	Current consumers are very much aware of the nutritional, medicinal, and health benefits.					
6	Mushroom sells faster.					
7	There are premium prices for mushrooms.					
8	I find mushroom production profitable.					
9	I earn a reliable and stable source of income from the mushroom.					
10	Mushroom addresses concerns about my family's health.					
11	Mushroom addresses concerns about food security.					
12	Mushroom production is acceptable in my social environment (family, friends, co-workers, neighbours).					
13	My social environment regards mushroom production as a promising employment opportunity.					

SECTION D: INHIBITING FACTORS (CONSTRAINTS) OF COMMERCIALISATION OF MUSHROOM PRODUCTION

Please, indicate your level of agreement with the following statements about what inhibit you for going into mushroom farming/producing mushrooms for sale (mushroom commercialization).

5= Very High Agreement (Agree with the statement completely)

4= High Agreement (Agree with the statement to a higher degree but not completely)

3= Moderate Agreement (Agree with the statement partially or in part)

2= Low Agreement (Agree with the statement to a small degree)

1= Very Low Agreement (Agree with the state to the lowest degree)

44.

Inhibitors of commercialisation of mushroom production		**Level of agreement**				
		1	**2**	**3**	**4**	**5**
1	I have inadequate mushroom production management skills.					
2	I do not get access to adequate quality spawn.					
3	I find mushroom production risky.					
4	Current consumers are limited in their utilization of mushroom.					
5	Current consumers dictate the price of mushrooms.					
6	Current consumers (supermarket, restaurant, individuals, and hotels) do not consume mushrooms all the time and so I do not get orders/sell mushrooms all the time.					
7	I do not receive marketing information.					
8	There are no certifying agencies to check mushroom standards					
9	I do not have access to any organisation involved in the processing of mushroom.					
10	I find it difficult to acquire land for mushroom production due to land tenure problems.					
11	My social environment sees me as inferior for producing mushroom.					

SECTION E: CONTRIBUTIONS OF COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH- FOOD RESEARCH INSTITUTE (CSIR-IFR) TO MUSHROOM COMMERCIALISATION

45.

Please rank the contributions of CSIR-FRI towards mushroom commercialization, from 1st to 4th (**1st means the highest contribution—you benefited (received) most from that service within the production year, 2nd means next highest…etc.) If a contribution does not apply to you don't rank it.** **NOTE: DO NOT GIVE THE SAME RANK TO MORE THAN ONE STATEMENT**		
CSIR-FRI ACTIVITIES	**Tick**	**Rank**
Training on mushroom cultivation technologies		
Extension and farm visits (e.g., advising on the production environment, pest and disease control, etc.)		
Supply of spawns		
Supply of compost bags		

Source: Author's construct.

THANK YOU VERY MUCH FOR YOUR COOPERATION!