**EFFECT OF INDUSTRIAL GROWTH ON SMALL-SCALE TOMATO FARMING: A CASE OF BUNGOKHOSUB-COUNTY IN MBALE DISTRICT, UGANDA**

**BY**

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**OF NATURAL RESOURCES MANAGEMENT**

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# DECLARATION

I, **ABDIRAHMAN MUSTAF ABDULLAHI** hereby declare to the best of my knowledge that this research dissertation titled “**effect of industrial growth on small-scale tomato farming. Case in Bungokho Sub-county, Mbale District”**has been conducted by myself and has never been submitted or published to any institution of high learning for any academic award or purposes.

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# APPROVAL

This is to certify that this research dissertation has been supervised by me and is ready for examination.

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# DEDICATION

I dedicate this dissertation to my parents, aunties, uncles, sisters and brothers for their continued unconditional support and commitment towards my education, may the almighty reward them abundantly and pour blessings upon them.

# ACKNOWLEDGEMENTS

I first of all acknowledge and appreciate Allah for this far that I have come. It has been a tough time up to this level but at the same time interesting learning process.

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# LIST OF ACRONYMS

COMESA: Common markets for Eastern and Southern Africa.

DCED: Donor Committee on Enterprise Development

EPA: Environmental Protection Agency

GDP: Gross Domestic Product

MAIF: Ministry of Agriculture, Animal Industry and Fisheries

NGO: Non- Governmental Organizations.

SSA: Sub-Saharan Africa

UNDP: United Nations Development Program

US United States

ISO International Standard Organization

NFA National Forestry Authority

NEMA National Environmental Management Authority

NAADS National Agricultural Advisory Services

SPSS Statistical Package for the Social Sciences

ANOVA Analysis of Variance

# ABSTRACT

This study examined the effect of industrial growth of small-scale tomato farming in Bungokho Sub-county in Mbale District. It targeted a population of 200 residents and randomly selected 133 respondents. The study used mixed methods research approach combining both qualitative and quantitative research design. It was therefore approached using a cross-sectional research design. The objectives included (a) to assess the economic contribution of tomato farming to the welfare of small scale growers (b) to examine the effect of industrial activities on small-scale tomato farming (c) to investigate the factors apart from industrial growth which constrain small-scale tomato farming (d) to investigate mechanisms adapted by small scale farmers to minimize the effect of industrial growth on tomato farming. Data was collected using self-administered questionnaires and interviews and the results showed that indeed industrial growth posed serious effects including; reducing size of farming land due to industrial expansion; affecting soil fertility; and making the farmers to abandon tomato growing for other lucrative economic activities such as entering into Boda-Boda business, and keeping animals on small scale. Other factors also affected small-scale tomato growing such as lack of improved seeds, unreliable climate information, and inadequate extension services. It was concluded that tomato growing in Bungokho sub-county has significantly contributed to the economic welfare of small-scale farmers. It further concludes that small-scale tomato growing has been affected by industrial growth through the loss of viable space for growing tomatoes that was primarily taken up by industries. The study however, recommended that the government of Uganda through the ministry of Agriculture, Animal and Fisheries should avail the necessary assistance to small scale tomato growers through providing agricultural extension services. It further recommended the Uganda Investments Authority to gazette specific areas / land as industrial parks so as to prevent the mushrooming factories that consume agricultural space.

# CHAPTER ONE:

# INTRODUCTION

## 1.0Introduction

This study investigated the effect of industrial growth on small-scale tomato farming in Bungokho Sub-County, Mbale district.

## 1.1. Background to the Study

## 1.1.1. Historical Background on the origin of cultivated and Wild Tomato Growing

Globally, the Tomato (Lycopersiconesculentum) is a New plant, originally found in Peru and carried back to Spain from whence it quickly spread to Italy (pommidoro) and France, where it was known as the pomme d'amour and thought to have aphrodisiac properties and by 1560, the tomato was becoming a staple of the continental European diet Goodwin, (1984) as cited by Ortega & Lederman, (2015).

Of interest is that while this exotic fruit from South America (along with other novel products such as potatoes, corn, beans, cocoa, and tobacco) was revolutionizing European eating habits, at the same time it was ignored or actively shunned in North America (Goodwin, 1984) cited by Ortega & Lederman, (2015).

The ancestral form of the cultivated tomato was originally confined to the Peru-Ecuador area. After spreading north possibly as a weed in pre-Columbian times it was not extensively domesticated until it reached Mexico, and from there the cultivated forms were disseminated (Jenkins, 1948) cited by Bergougnoux (2014).Bergougnoux (2014) reports that the tomato plant was first imported from the Andean region to Europe in the 16th century, and today tomato is widespread throughout the world and represents the most economically important vegetable crop worldwide. Tomato is not only traded in the fresh market but is also used in the processing industry in soups, as paste, juice, and ketchup. It is an incredibly rich source of important nutrients such as lycopene, β-carotene and vitamin C, which all have positive impacts on human health. Its production and consumption is increasing with population growth.

Crop farming has existed since the “dark ages”. In the Andes of South America, the ancient Egyptians, as well as most indigenous cultures around the world, routinely used a stick to make a hole in the ground, put seeds in the soil by hand, and covered the seeds with the foot. Even today hundreds of thousands of farmers in Central and South America seed their crops using the same technology. About 10,000 years BC, people harvested their food from the natural biological diversity that surrounded them, and eventually domesticated their crops. Moreover; millions of hectares of land have been traditionally sown with a hand jab planter (Zilberman, 2001).

In the early 1900s, more than half of Americans were either farmers or lived in rural communities. Most U.S. farms were diversified, meaning they produced a variety of crops and animal species together on the same farm, in complementary ways (Zilberman, 2001). Although conditions like these still exist, the industrialization of agriculture radically transformed how the vast majority of food is produced in the U.S. and many other parts of the world. However, industrialization also has resulted in an agriculture that degrades natural resources, depletes human resources, and destroys economic opportunities. An industrial agriculture is inherently incapable of maintaining its productivity and usefulness to society (Ortega & Lederman, 2015)

Likewise, (Ortega & Lederman, 2015) stated that prehistoric crop farming in Asia and Africa in particular proceeded from simple gathering of grains from wild stands to intentional propagation, often with planting sticks. However, by 4000 BC, the first farmers in Africa were using ox-drawn ploughs to dramatically expand their cropping. The development of crop farming spans thousands of years in Africa have been affected by human cultures, climate variations, and evolving technologies.

Though the East Africa’s smallholder farmers, who contribute 80 percept of food and agricultural production in sub-Saharan Africa and much of the world’s food supply, are being encouraged by big business, governments and NGOs to become less subsistence based and more entrepreneurial by tailoring production to market forces (World Bank Development Indicators, 2014). In Kenya, most small scale farmers practice mixed crop farming where they grow various types of crops on the same piece of land which may not lead to increased yields. In the 1950s until independence in 1962, British Colonial Office policy encouraged the development of co-operatives for subsistence farmers to partially convert to selling their crops: principally coffee, cotton, tobacco, and maize.

In Uganda, most small scale farmers practice mixed crop farming where they grow various types of crops on the same piece of land which may not lead to increased yields. In the 1950s until independence in 1962, British Colonial Office policy encouraged the development of co-operatives for subsistence farmers to partially convert to selling their crops: principally coffee, cotton, tobacco, and maize. David Gordon Hines (1915-2000) (as Commissioner of Co-operatives from 1959 to independence in 1962 and then as a civil servant until 1965) developed the movement by encouraging eventually some 500,000 farmers to join co-operatives. Moreover, the farmers in Uganda’s 2.5 million small holdings and scattered large commercial farms provide the majority of their own and the rest of the country’s staple food requirements (World Bank Development Indicators, 2014).

Uganda’s key crop farming products can be divided into cash crops and food crops; yet Mbale district’s crop farming is characterized by smallholder farmers with hand hoes as the major production tool. Farmers produce various commodities, mostly for own consumption anda few for sell to the surrounding districts in Bamasaba region. The primary economic activity in the district is agriculture inform of crop farming. Some of the main crops are coffee, tomatoes, beans, bananas, maize, onions, potatoes, carrots, and sweet potatoes. The smallholder farmers lack transport, storage facilities for perishable crops such as tomatoes and technology to help them increase their production and reduce pests and disease. They also lack access to financial services, to give them capital for improving and expanding their productivity. Crop farming is mainly rain-fed as Mbale district is situated along the slopes of Mount Elgon and rainfall in most parts of the region is plentiful and allows for intercropping. Although available literature indicates that crop farming is effective in reducing poverty and enhancing the overall economic welfare, industrialization improves household incomes exponentially (United Nations Development Programme, 2019).

Currently, in Mbale District, there are too many people engaged in agriculture, though they lack the potential to emphasise in development choices on an initial phase of intensive industrialization (Arbache et al, 2008). The sustained growth of non-agricultural employment and the transfer of part of the rural labour force to the towns have made it possible to stabilize the number of agricultural workers and halt the growth of population pressure on the land, thus creating the conditions for improved labour productivity and peasant incomes, industrialization has been accompanied by a rapid rise in the demand for food and in agricultural prices, creating profitable outlets for agriculture and thus increasing purchases of industrially produced goods.

## 1.1.2 Theoretical Background

The study was guided by three theories and these were documented as follows.

## (a) The economic growth theory

The economic growth theory which was championed by (Robert Solow and Trevor Swan, 1950) suggested that economic growth only comes from increasing the quality and quantity of the factors of production, which consist of four broad types: land, labour, capital, and entrepreneurship. The factors of production are the resources used in creating or manufacturing a good or service in an economy. In this theory, it was proposed that for an economy to grow there is increasing need for capital investment most especially from the capitalist point of view. This theory places industrial growth at the centre of development while ignoring many sectors of the economy such as agriculture, tourism and many others. In relation to the ever increasing industrial growth which demands for many factors of production such as land, labour and capital, tomato growing is also likely to be affected in the same way since industries consume the same piece of land as opposed to agriculture.

## (b) The endogenous growth theory

The study was further guided by the endogenous growth theory championed by (Paul Rommer, 1980’s). Endogenous growth theory emerged in the 1980s as an alternative to the neoclassical growth theory. It questioned how gaps in wealth between developed and underdeveloped countries could persist if investment in physical capital like infrastructure is subject to diminishing returns.

This theory maintains that economic growth is primarily the result of internal forces, rather than external ones. It argues that improvements in productivity can be tied directly to faster innovation and more investments in human capital from governments and private sector institutions. The theory has got its own major implications as observed by (Sanders, 2021) who suggested that the nature of governmental policies play a significant role in raising an economy’s growth rate if the policies are directed toward enforcing more market competition and helping stimulate innovation in products and processes. That there is also increasing returns to scale from capital investment in the “knowledge industries” of education, health, and telecommunications. It further stresses that private sector investment in research and development is a vital source of technological progress for the economy (Sanders, 2021).

## (c) The unified growth theory

The unified growth theory was championed by OdedGalor (2011) who urged it from an economic perspective. He identified the historical and pre-historical forces behind the differential transition timing from stagnation to growth and the emergence of income disparity around the world. The unified theory was developed in light of the failure of endogenous growth theory to capture key empirical regularities in the growth processes and their contribution to the momentous rise in inequality across the nations in the past two centuries. The new growth theory is an economic concept, positing that humans' desires and unlimited wants foster ever-increasing productivity and economic growth. It argues that real gross domestic product (GDP) per person will perpetually increase because of people's pursuit of profits.

## 1.1. 3 Contextual framework

Agriculture is central to the economy of Uganda; it employs about 82% of the national workforce and is responsible for generating over 20% of Uganda’s GDP (Shames, *et al.,* 2015). Over 800,000 smallholder farmers in the Mbale, Manafwa and Bududa Districts (Mbale region, total area 137,128 ha) depend on agriculture as their main source of livelihood (Balikoowa, et al., 2019). Farmers in these districts mainly produce bananas and maize, which are consumed locally and exported to neighbouring countries like Kenya, as well as annual horticultural crops, such as carrots, Irish potatoes, onions, passion fruit and tomatoes. The Mbale region is also among the major coffee growing areas in Uganda, which is a major source of income for many farmers in the region. Additionally, most farmers also own livestock, which are usually kept in zero grazing systems or in combination with partial grazing (Okonya, *et al*.; 2013).

However, the fertile land has also resulted in a high rate of population growth and land fragmentation. The Mbale region has a high population density of about 1000 people per square kilometre, which means that the average size of land holding is small, between about 1 and 2 acres, forcing farmers to till the land intensively throughout the year (GoU, 2013). In addition to making the soils less fertile and productive, these unsustainable farming practices also contribute to soil erosion. Furthermore, there has been significant forest degradation in the Mbale region (Shames, 2015).

Because the region is mountainous, these unsustainable practices can easily lead to mud-slides when the soil is exposed to large amounts of rainfall. For these reasons, the Mt. Elgon region is one of the most vulnerable areas in Uganda to climate change, which was exemplified in the tragic landslide in Bududa and Manafwa Districts in March 2010. With the establishment of the Mbale industrial Park as well as other smaller cropping up industries, the future of small-scale farmers most especially the tomato growers, is highly threatened (Shames *etal*, 2015).

## 1.2 Statement of the Problem

Given that Uganda is home to 42 million people, domestic and regional demand for agriculture commodities is on a rapid rise, and an increasing number of urban dwellers demand more tomatoes as a protein-rich diet. By 2050, the World Bank estimates that about 102 million people will live in Uganda, providing massive opportunities for the country’s agriculture sector and wider agro-food systems (Sebudde et al, 2018).

In the recent past, tomato has been one of the horticultural crops with widespread production in both semi-urban and rural areas in the Eastern parts of Uganda including Bungokho sub-county in Mbale district, it was one of the key economic activities that greatly contributed to household incomes of the small scale farmers (Tusiime, 2014). Currently, despite the growth of industries including agro-based industries in Mbale district, the productivity of tomatoes has greatly declined. This is attributed to the increasing rate of land grabbling from the agricultural natives who practiced tomato growing, high pollution from the current industries, pests and diseases, un-reliable markets, lack or no extension services to tomato growers among others (Ssekyewa, 2006). Consequently, land grabbing by investors, pollution, and labour shortages caused by the industrial growth in the area has evidently led to a decline in tomato production in the area in terms of significant implications on natural resource management, water resources, food security, food loss, human health, as well as the potential to reverse the country’s development trajectory (Sebudde et al, 2018). Thus, the future of tomato growing seems to be threatened with the growth of manufacturing industries in Bungokho sub-county in Mbale district. Hence, this study therefore aimed at examining the effect of industrial growth on small-scale tomato farming in the context of Bungokho Sub-County in Mbale district, Uganda.

## 1.3 Objectives of the Study

## 1.3.1 General Objective

The main objective of the study is to examine the effect of industrial growth on small-scale tomato farming**.**

## 1.3.2. Specific Objectives

1. To assess the economic contribution of tomato farming to the welfare of small scale growers in Bungokho Sub-County Mbale District.
2. To examine the effect of industrial activities on small-scale tomato farming in Bungokho Sub-County Mbale District.
3. To investigate the factors apart from industrial growth which constrain small-scale tomato farming in Bungokho Sub-County Mbale District.
4. To investigate mechanisms adopted by small scale farmers to minimize the effect of industrial growth on tomato farming in Bungokho sub-county.

## 1.4. Research Questions

1. What is the economic contribution of tomato farming to the welfare of small scale growers in Bungokho Sub-County Mbale District?
2. What are the effects of industrial activities on small-scale tomato farming in Bungokho Sub-County Mbale District?
3. What are theother factors apart from industrial growth which constrain small-scale tomato farming in Bungokho Sub-County Mbale District?
4. What are mechanisms adapted by small scale farmers to minimize the effect of industrial growth on tomato farming in Bungokho sub-county?

## 1.4. Scope of the Study

## 1.4.1. Geographical Scope

The researcher conducted the study from Bungokho sub-county, in Mbale District. Bungokho is a sub county in Mbale district of Uganda and it has 4 parishes and 65 villages. The district is located in the Eastern region of Uganda, it lies between the longitudes of 34°E, 35°E and latitude 00°45°N with land area of 534.4 square Km and population density of about 620 persons per square Km. The study was conducted from Bungokhosub-county in Mbale District because of increased reports of low yields of Tomatoes despite having rapid industrial growth in the region.

## 1.4.2. Subject Scope

The study focused on examining the effect of industrial growth on small-scale tomato farming in Bungokho Sub-County, Mbale district. To achieve this, the study examined the economic contribution of tomato farming to the welfare of small scale growers, the effect of industrial activities, the factors constraining small-scale tomato farmers and the mechanisms adopted by small scale farmers to minimize the effect of industrial growth on tomato farming.

## 1.4.3. Time Scope

The study was conducted for a period of six months and was mostly affected by the COVID-19 pandemic which led to working under the directives of the president who brought the country into an extended lockdown. Data was collected between September 2020 and January 2021 when the lockdown was eased.

## 1.5 Significance of the Study

The outcome of this study will be useful to the government in terms of directing policy design and strengthening policy implementation in the agricultural financing.

The study will be a useful guide to the government of Uganda, policy makers, policy analysts and the public on how crop farming can be used as a tool for economic welfare of Uganda.

This study will also guide lower and higher institution of learning to elicit and clarify on the many issues about Tomato crop farming and Economic Welfare.

The study has been designed at a time when Uganda is grappling with a majority youth unemployment and going hungry, yet agriculture presents opportunities to improve livelihoods.

## 

## 1.6 Conceptual Framework

The framework presents interplay of how small-scale tomato farmingis being affected by industrial growth as the independent variable as shown in the figure 1 below.

**Independent Variable Dependent variable**

**Industrial Growth Small-Scale Tomato farming**

* Agro-industries
* Manufacturing industries
* Industrial expansion
* Tomato yields/output
* Quality of tomatoes
* Effect on soil quality

**Intervening variables**

* Government policy
* Institutional framework

**Other factors**

(a) Lack of Improved Seeds

(b) Shortage of Labour

(c) Unreliable climate information

(d) Inadequate Extension Services

## Figure 1: Conceptual Framework

The conceptual framework above indicates that independent variable is industrial growth which was measured as; agro-industries, manufacturing industries, and industrial expansion. On the other hand, the dependent variable is; tomato yields/output, quality of tomatoes, and effect on soil quality. Whereas the intervening variables included; Government policy, Institutional framework, lack of improved seeds, shortage of labor, unreliable climate information and in adequate extension services.

## 1.7 Definition of key terms

**Industrial growth**

Industrial growth can be defined as a boost and or an increase in the rate of industrial establishments in an area over time. The industrial growth is a result of demand for new products or services offered by companies in the field.

**Tomato farming**

Tomato farming is the cultivation of tomato for the production of tomato fruits. Tomato farming can be done in the open field, pots, greenhouses, gardens and containers. Tomato plants' fruits are harvested after 60 – 90 days depending on variety. Tomato seedlings are usually managed in nurseries for 3 – 4 weeks.

**Small scale farming**

Small-scale farming describes a farming method using very little land (usually around 1-10 acres) and often using very little to no expensive technologies. Small-scale farming is closely tied with more sustainable agricultural methods including organic, biodynamic and permaculture (etc.) farms.

# CHAPTER TWO:

# LITERATURE REVIEW

## 2.0. Introduction

This chapter focuses on review of related studies, and the discussion of the appropriateness of the theories that informed this study.

## 2.1 Review of Literature

## 2.1.1The economic contribution of tomato farming to the welfare of small scale growers

In Uganda, tomatoes are produced in different agro-ecological zones through commercial as well as small scale farmers both as a source of income as well as food. However, the type is limited to few crops and production is concentrated to some pocket areas (Akemo and Kyamanywa, 2001). In spite of this, the production of tomato farming varies from cultivating a few plants in the backyards for home consumption up to a large-scale production for domestic and export markets.

Recently, despite the ups and downs observed, the demand for tomato farming especially for export is increasing (Altenburg and Lütkenhorst, 2015). It has been widely demonstrated that rural women, as well as men, throughout the world are engaged in a range of productive activities essential to household welfare, agricultural productivity, and economic growth. Tomatoes are grown in many parts of the world contributing significantly to income security and the nutritive diet of many households.

In fact, tomato farming can generate high income for the farmers because of high market value and profitability. They also have high nutritive value compared to cereals. Tomato farming is an important feature of Ugandan’s diet that a traditional meal without it is assumed to be incomplete (Amin, 2005 ). In developing countries, the consumption of tomatoes is generally lower than the FAO recommendation of 75kg per year in habitant (206g per day per capita). In Uganda, tomato production has been on-going for decades, providing employment and income for the increasing population especially during the long dry season. However production is constrained by inadequate infrastructure, agronomic and socio-economic variables.

Tomato farming was responsible for $1.2 billion in revenue, while fruit production generated $789 million in East Africa (Arbache et al, 2008). Farm businesses pay salaries, taxes and utilities. They also purchase goods and services from their local communities, multiplying their impact and contributing to off-farm employment. The further processing and handling of produce results in additional economic impact which can be directly attributed to agricultural production.

As a lucrative business, tomato guarantees returns in investment (Beegle, 2016). Talking about economic importance of tomatoes in Uganda, tomato industry remained one of the best agricultural investment options in the country, owing to the fact that, tomato production is a lucrative business and it is that business which guaranteed good returns on investment. It is because tomato is being demanded for domestic use and industrial use in Uganda.

As source of rich minerals, tomato is used as juice, sauce when processed. Tomato is one of those common crops that are rich in minerals, as well as rich in vitamins. Tomato is used as salad hence; you can eat tomatoes at its raw state as an important recipe of salad (Beegle, 2016). Tomato is processed into juice and it is also processed into sauce for human consumption. Of course, tomato is also used as a better ingredient whenever there is preparation of different kinds of food, especially stew. Tomato paste or tomato packaged in tins is of various sizes and these served various segments of Uganda’s markets.

Taking a look into the international tomato market, Uganda has made relative contribution to the global supplies, which have actually earned the country foreign exchange and this is likely to stimulate national food sufficiency if more attention is given to tomato production in Uganda (Bodunde, 1993) as cited by (Altenburg and Lütkenhorst, 2015). At this point however, although processed tomato-based products supplied by local processors are scarcely noticed, perhaps, because of the inadequate local processing facilities, there is possible improvement towards this.

Tomato market in Uganda is growing very fast given the increasing population and this has brought about fair development in the tomato market (Cavana et al, 2001). Given this development, there is a considerable substantial investment prospects in this sector, particularly in the area of tomato processing. Interestingly, there is a registered boost as the government continues to emphasize the importance of processing of agricultural products. The sector is very attractive to every entrepreneur who is willing to front better and good brand quality, since tomato products are used daily, with its high repeat-sales tendency given its long life cycle.

Ugandans are gainfully employed in agriculture and tomato growing is one of the main crops that they entirely grow and the economic importance of tomato growing in Uganda is that it helps in offering Ugandans employment (Chang, 2009). There is no gainsaying that outside other sectors, like the oil sector, the agricultural sector remained the fulcrum by which the economy of Uganda depends on. For example, in the area of commercial tomato production, it has provided jobs to over 50% of the peasant farmers in rural areas.

The economic importance of tomato in Uganda cannot be over-emphasized. By the virtue of the commercial tomato production in the country, food is being put on the table of the Uganda’s fast-growing population (Altenburg and Lütkenhorst, 2015). Relatively, national development has been made possible owing to the foreign exchange earnings, as the tomato produce are exported. This development has also reached on some other vital areas. Besides the extension of such funds made from tomato production in external areas of development, the private sector also have benefited substantially as a result of the provision made by tomato production alone, in terms of different basic raw materials which have been made available to various industries.

Tomato goes with other raw materials during processing and packaging increases their costs. Tomato goes with other raw materials, while undergoing processing. When tomato is processed, it will go with raw materials like grease, salt, oil as well as cleaning materials like sugar and other organic preservatives (Amin, 2005 ). And during packaging, materials used for packaging are both metal cans and cardboard cartons. Although, these raw materials used during processing and the materials used in packaging are available in Uganda, the demand of these materials has been boosted.

Ugandan farmers, having been trained and sensitized on tomatoes production have come to appreciate the fact that there are different sizes and there are different costs as well as different production capacities of tomato processing plants. Training and sensitization has offered Ugandan farmers an ample opportunity to choose whether to do the small, the medium and even the big size. This however happened immediately after there is analysis of the Uganda’s local peculiarities and perhaps the availability of infrastructural facilities.

## 

## 2.1.2. The effect of industrial activities on tomato farming

Industrial growth also has resulted in an agriculture that degrades natural resources, depletes human resources, and destroys economic opportunities. An industrial agriculture is inherently incapable of maintaining its productivity and usefulness to society. It fails every test of sustainability (Arbache et al, 2008). As American agriculture has become more industrial, it has become increasingly dependent on fossil energy and other finite natural resources. The total food system currently claims about twenty-percent of all fossil energy used in the U.S., with tomato farming accounting for about one-third of the total percentage. In fact, our industrial food system requires about ten calories of fossil energy for every calorie of food energy produced. Supplies of fossil energy are finite, and there is a growing consensus that fossil energy in the future will be far less plentiful and more costly.

Industrial agriculture also is a significant contributor to the depletion of social energy. Tomato Farm workers today are among the lowest paid workers in the U.S., while working under dangerous and disagreeable conditions, most without adequate health care or other fringe benefits (Beegle, 2016). A growing reliance on migrant tomato farm workers also creates cultural and political conflicts, particularly in times when good paying jobs are few. Many tomato farm families fare little better, as independent farmers are periodically forced out of business to make room for further corporate consolidation. As a consequence, rural communities in agricultural areas have suffered decades of economic and social decline and decay.

Once the backbone of US agriculture, medium-sized tomato farms are a dwindling breed, which means that fewer and fewer people make their living as tomato farmers a trend that has been bad for the economies of rural communities and tomato farm states(Bodunde, 1993).

Monoculture exhausts soil fertility, requiring costly applications of chemical fertilizers. In addition, soils used to grow annual row crops and then left bare for much of the year have poor drought resistance, increasing irrigation costs. Furthermore, monoculture degrades soil structure and leaves it more vulnerable to erosion, resulting in costs for soil replacement, clean up, and lost farmland value (Cavana et al, 2001). Industrial tomato farms don't support the rich range of life that more diverse tomato farms do. As a result, the land suffers from a shortage of the ecosystem services, such as pollination, that a more diverse landscape offers.

Herbicides and insecticides commonly used in tomato farming have been associated with both acute poisoning and long-term chronic illness (Arbache et al, 2008). Water pollution from fertilizer runoff contaminates downstream drinking water supplies, requiring costly clean up measures with an annual price tag of nearly $2 billion Industrial tomato farming, especially in the central United States, mostly produces commodity crops like corn and soybeans. These crops are used to make the processed foods that dominate the US diet, with serious—and enormously costly—health impacts. The overuse of antibiotics in CAFOs has accelerated the development of antibiotic-resistant bacteria, which has taken a toll both in lives and health care dollars.

Industrial systems historically have degraded their environment and have depleted the natural resource base (Cavana et al, 2001). Commercial fertilizers and pesticides essential elements in specialized, industrialized tomato farming have become a primary source of growing concerns for environmental pollution. Industrialization has transformed a farming created for the purpose of converting solar energy to human-useful form, into an agriculture that uses more non-renewable fossil energy than it captures in solar energy from the sun.

Industrial systems of production also degrade the human resource base. Henry Ford is quoted as once saying the biggest problem in running a factory is that you have to hire whole people when all you need is two hands (Cavana et al, 2001). Large factory tomato farms transform independent decision makers, into tomato farm workers, into people who only know how to follow instructions or directions, but not how to make decisions.

Industrial agriculture, inherently, is management extensive. It allows fewer tomato farmers to farm more land by using more capital machinery and equipment -- and more purchased inputs. Industrialization of tomato farming made sense as long as the tomato farmers who were displaced in the process could find more productive employment in the larger economy. However, the days of good paying factory jobs are gone (Chang, 2009). American industries are reducing and not increasing employment at all levels. Robots and computers are replacing people, and eventually will do anything and everything that can be done without thinking. American industry simply doesn't need any more displaced tomato farmers.

As tomato farms have grown larger and more specialized, agriculturally dependent rural communities have withered and died. Larger tomato farms meant fewer farms and fewer farm families to support local schools, churches, public institutions, and retail businesses. In addition, larger tomato farms tend to bypass local communities in purchasing production inputs and in marketing their products (Altenburg and Lütkenhorst, 2015). It takes people, not just production, to sustain local communities. The fundamental purpose of agricultural industrialization was to make it possible for fewer.

## 2.1.3. The factors apart from industrial growth which constrain small-scale tomato farming

Smallholder agriculture in the Africa countries studied has been facing numerous constraints. While some are unique to each of the countries, most are of a similar nature, implying that common solutions would address them across countries. The constraints discussed below are not new, but rather long-standing and perhaps even chronic. In addition to smallholder farmers, the constraints to some extent also impact large-scale or plantation farmers.

Land tenure, access rights and land management

The uncertainties regarding land tenure and the inadequate access to land have been a critical challenge to smallholder farming in East Africa. These problems can be examined from different perspectives. The constraints related to the tenure system, such as insecurity of land tenure, unequal access to land, lack of a mechanism to transfer rights and consolidate plots, have resulted in under-developed agriculture, high landlessness, food insecurity, and degraded natural resource.

Furthermore, the land ownership issues go well beyond small sizes of plots. For example, in Ethiopia, all land is state-owned, according to the country’s 1994 constitution. In practice, traditional land tenure arrangements prevail as an outcome of subsistence agriculture, with peasant associations responsible for allocating land to residents (Kamara, et al 2004). According to Kebede (2002), privatization of land would seem to be the most effective way to reduce insecurity associated with the tenure schemes and uncertainties created by state ownership.

Equally important, in terms of access to additional land, is proper management of the existing one. According to Kimaru and Jama (2005), in East Africa sustained gains to agricultural productivity are threatened by land degradation, especially land erosion and loss of fertility. A number of programs during the past several decades were implemented by the Swedish International Development Agency and other development partners with a view to preserve the agricultural land in the region. The study found that clear land-use and agricultural policies need to be developed to provide a framework for researchers, extension workers and smallholder farmers on environmentally-sensitive practices. Nevertheless, the lack of clarity of property rights and un-equitable access to land exacerbate the land degradation problem.

Financing agriculture and access to credit

For investment, smallholder farmers in all four countries depend on savings from their low incomes, which limits opportunities for expansion.12 For example, a survey of a sample of 344 rural households in Tanzania between May and August 2001 showed that half of total rural household income came from farming, 46.6 per cent from nonfarm employment (wages and self-employment) and less than 4 percent from remittances. Because of the lack of collateral and/or credit history, most farmers are bypassed not only by commercial and national development banks, but also by formal micro-credit institutions. In addition to own sources, farmers thus rely on incomes of friends and relatives, remittances, and informal money lenders. Furthermore, in most parts of Uganda and East Africa at large, access to financial credit has been preferably very inaccessible to small scale farmers in the region. Worse enough, even the existing agricultural finances are highly levied with over 30% interest rates that make it a tumbling block to small scale farmers (Altenburg and Lütkenhorst, 2015).

Lack of reliable market

Market availability is a big challenge facing most tomato producers in developing countries especially those in Africa. This challenge can be attributed to many factors. One of the factors is the pattern of production resulting in gluts. Although there has been a tremendous improvement of the use of irrigation scheduling in dry season tomato production (Ofori, 2001) a greater proportion of producers still rely on rain fed production. The bulk of tomato production in Nigeria for example is carried out during the wet season of the production year (Adenuga et al, 2013). This causes high peaks in production which is always more than fresh consumption demand of the fruit locally. The problem is further compounded by the lack of processing facilities which can be used to process the fruits into a more durable form for later consumption. Producers from developed countries always have supply contract with multinational supermarkets to supply tomatoes. An example is, in the case of producers in Africa, there is no information on reliable market availability. There is lack of communication between producers and consumers, and also lack of market information (Kader 2005). This has been the main reason for the mismatch between production and available markets.

Diseases, pests and physiological disorders in tomato

Tomato varieties vary in their resistance to pests and diseases. Modern hybrids focus on improving disease resistance over the heirloom plants. Common tomato diseases include; rots cankers, mildews, blights and viruses (Agrios, 2005).

Other dreaded diseases are wilts caused by bacteria and fungi and anthracnose (Iannotti, 2019, Reddy, 2018 and Tomato Diseases Fact Sheet, 2004). Some of the serious diseases affecting tomato include; Late Blight (Phytopthorainfestans); is one of the most serious diseases affecting open field grown tomato caused by a very destructive fungus. The disease occurs under cool and high humidity conditions and spreads rapidly from a hotspot to the entire farm by distribution of the sporangia. It is characterized by rapid drying of leaves, brown streaks develop on the stem and brown dry rot is observed on the fruit. Under severe infection up to 100% loss may occur. The disease is however not common under greenhouse conditions due to the elevated temperature, reduced air movement and absence of moisture on the leaf surface where drip irrigation is used (Shankara et al, 2014; Agrios, 2005; Naika et al., 2005).

Early Blight (Alternariasolani); the disease manifests as stem cankers on seedlings with small irregular dark brown spots on the older leaves leading in partial defoliation of the crop. Infections begin as small brown spots on older leaves that quickly enlarge. The lesions develop a "bulls-eye" pattern of concentric rings that can be seen. The fungus survives on the crop debris thus infected plant materials should be disposed properly to reduce spread (Agrios, 2005; Naika et al., 2005).

Bacterial Cankers (Clavibactermichiganensis) is a seed borne disease whose symptoms are not apparent until the disease is well established. The disease causes up to 90% crop loss. Symptoms include wilting and curling of the leaflets of the lower leaves. Dried, whole leaf curls upwards, turns brown, wither but still remain attached to the stem. If affected, young fruits show slight discoloration of the vascular system, deformation and stunting of fruit and seed abortion (Shankara et al, 2014; Agrios, 2005). Bacterial Wilt (Ralstoniasolanacearum); the disease causes wilting of tomato and potato etc.

Poor Field Sanitation

Sanitation is of great concern to produce handlers, not only to protect produce against postharvest diseases, but also to protect consumers from food-borne illnesses. Fresh produce has being one of the main sources of food-borne illness outbreaks (Gombas et al, 2003). For example, Salmonella, Hepatitis and Cyclospera are among the diseases causing organisms that can be transferred via fresh fruits and vegetables like tomatoes (Government of India, undated). Use of a disinfectant in pre-cooling water can help to prevent both post-harvest diseases and field heat in produce. Fruits and vegetables are usually treated with chlorinated water after washing to reduce the microbial load prior to packaging. Workneh et al. (2012) indicate that anolyte water dipping disinfection of tomatoes did not only reduce the microbial loads on the fruits but also maintained superior quality of tomatoes during storage.

Lack of access or bad nature of roads

Lack of access roads to production fields in many African countries is a major challenge hampering the success of the tomato industry. Majority of the production fields are located in remote areas, which are far from improved roads making access to competitive markets difficult and costly. An example of a road that links the farming district of Bulambuli, Nakapiripirit in Eastern Uganda to major marketing centres. In cases where there are roads linking these farming sites, these roads are in a very deplorable condition. A study conducted by Yeboah (2011) indicated about 76% of farmers and traders in BrongAhafo region of Ghana complained of bad roads affecting their business. The bad state of road infrastructure makes it very difficult, expensive and time consuming to transport harvested produce to marketing centres.

Meanwhile any delay between harvest and consumption of the tomatoes can result in losses (Kader 1986) cited by (Altenburg and Lütkenhorst, 2015). Losses of up to about 20% are incurred by farmers due to transportation delays (Babatola et al, 2008). This claim may even be an underestimation of the actual transportation losses as vehicles which ply these deplorable roads sometimes get stuck in the mud and may take hours or even days to get them out which may result in losses higher than the 20% assertion by Babatola et al. (2008). Bad road infrastructure is a major challenge facing most developing countries and this challenge is likely to affect both producers and distributors of tomatoes for a long period.

Lack of processing equipment/factories

The unavailability of processing factories or redundancy in the available ones is also another challenge tomato producers in developing countries are faced with. Senegal promoted the farming of tomatoes and erected processing plants to establish an industry that made Senegal the 23rd largest processor in the world during the early 70s (Food processing Africa, 2012). Produce from farmers were used as the raw materials for these processing industries. A study in 2007 revealed that Senegal's processing had fallen from 73,000 tons of concentrate tomatoes in 1990 to 20,000 tons in 1996 processing year, while imports from EU’s tomato increased from 62 tons in the year 1994 to whooping 5,348 tons in 1996. The Senegalese processors apparently found out that it was cheaper to buy and dilute tomato paste from Italy than purchasing tomatoes from local farmers. Local producers were therefore left to their fate with their harvest which has eventually caused a reduction in production figures.

Physiological disorders

Finally, tomato fruits exhibit a number of physiological disorders associated with agronomic practices and environmental factors. These disorders are in some instances confused with pest or disease attacks according to the Report on Plant Disease and Physiological Disorders in Tomato, 2014, they include: Blossom end rot; this is not a pathological disease, but a physiological disorder(Delahaut and Stevenson, 2004). The condition is caused by calcium deficiency. The early sign is a water soaked spot near the blossom end of the fruit. The surface of the spot becomes dark, leathery and large. The spot remains dry unless invaded by bacteria or fungi.

Other causes of the condition are excessive nitrogen application during the early stages, infrequent irrigation and drought (Margit and Ingrid, 2016). Fruit cracking; is a condition that occurs when internal fruit expansion is faster than the epidermal expansion which causes the epidermis to split. It is caused by irregular water uptake, high and fluctuating temperature and standing water on the fruit surface (Margit and Ingrid, 2016). Sun scald also known as the sun burn; occurs when the fruit is exposed to too much sun. This is because very high temperature from the sun impairs development of the red pigment. Thus results in the development of yellow pigment on the fruit shoulder. The yellow pigments are very susceptible to further sun burns. The tissues therefore die fast and turn black (Delahaut and Stevenson, 2004).

## 2.1.4. The mechanisms adapted by small scale farmers to minimize the effect of industrial growth on tomato farming.

There is need to practice organic tomato farming and this quite logically has received a lot of early attention in the sustainable agriculture movement because the productivity of organic farms depends on collecting and storing solar energy. Other organic-like approaches to tomato farming, such as biodynamic, holistic, ecological, and permaculture also have all found a home under the conceptual umbrella of sustainability (Beegle, 2016). The sustainable tomato farming movement includes all farmers who are trying to meet the needs of the present without diminishing opportunities for the future. However, sustainable tomato farmers must always be mindful of the impacts of their individual decisions on the whole of their farming operation, as a complex, dynamic, interdependent, living system.

Starting from the ground up, there is needed to ensure soil mineralization. Industrial tomato farmers feed crops and livestock that are then used as raw materials to manufacture food for people. Sustainable tomato farmers feed the soil, the soil feeds crops, and crops are used to produce food for animals and people (Bodunde, 1993). Mineralization is the process by which chemical compounds in the organic matter of soils are made available to plants through decomposition or oxidation. A wide assortment of macro and micro plants nutrients are mineralized through complex, interrelated chemical and biological processes in the soil. These processes allow plants to combine solar energy with energy in the living and non-living elements of the soil to produce energy that can be metabolized by other living things, including people.

Tomato farmers should attempt to balance macro- and micro-nutrients in the soil to create an ideal soil environment that will support healthy plant growth and development (Chang, 2009). Others should focus on macro- and micro-biological activity in the soil, as soil organisms play a critical role in processes of mineralization. However, both groups are trying to create a healthy chemical and biological balance in the soil with the ultimate objective of producing healthy crops that will provide feed for healthy animals and food for healthy people. They should understand the ultimate objective of tomato farming is healthy people, not simply an abundance of cheap feed or cheap food.

There is need for sustainable tomato farmers to focus more directly on the health and productivity of their crops and animals (Cavana et al, 2001). They should use various crop rotations and integrate crop and livestock enterprises to maintain soil fertility and to manage agricultural pests. They should use cover crops and catch crops, which yield no marketable product, but make the farming systems as a whole work more effectively. They should attempt to select varieties of crops and breeds of livestock that fit their particular farms' soils, topography, and climate and their particular approach to farming. Sustainable farmers understand that healthy crops and livestock are just one link in the value chain of a sustainable food system (Beegle K, 2016).

## 2.2. Empirical Studies

By far, the biggest negative effect of industrialization is on the environment, pollution is the most common by-product of industrialization (Altenburg and Lütkenhorst, 2015). However, the degradation of ecological systems, global warming, greenhouse gas emissions, and the adverse effect on human health have garnered widespread concern. Because many industrialized companies are often not forced to pay damages for the environmental harm they cause, they tend to impose a major negative externality on human society in the form of deforestation, extinction of species, widespread pollution, and excessive waste. In the United States Congress appointed the Environmental Protection Agency (EPA) to issue limits for toxic air emissions, rules to phase-out ozone-depleting chemicals and their proper disposal, and other major tasks to reduce environmental risks (Arbache et al, 2008).

Industrial growth typically leads to the migration of workers to cities, automation, and repetitive tasks. Due to these factors, factory workers tend to lose their individuality, have limited job satisfaction, and feel alienated (Beegle, 2016). There can also be health issues, brought on by dangerous working conditions or simply factors inherent in the working conditions, such as noise and dirt.

The entry into the local market of substandard, counterfeit and contra-band products has unfairly reduced the market share for locally manufactured products (Cimoli, 2009). Counterfeit trade has also discouraged innovation efforts, reduced the government revenue base and some are a health- hazard to consumers. One can also not ignore competition from other countries for the Kenyan Market exemplified by the current battle between the Sugar manufacturers and COMESA to uphold the ban stopping other COMESA countries from entering the Kenyan sugar market. If they are allowed with the prices they offer, Kenyan sugar industry will be all but done.

Informality and poor sustainability of most local initiatives hamper industrialization. Majority of the micro and small industries are informal, rural based and have a high mortality rate (Dinh, et al, 2012). Due to the informality and concentration of formal firms in major towns, there are weak linkages, inadequate Business Development Services and subcontracting arrangements with the medium and large firms. In addition, the growth and graduation of the firms in this sector has not fully realized its potential due to a number of factors such as poor market access, restrictive legislation and regulation, high cost of credit, poor infrastructure and access to land.

Lack of investment in an industrial knowledge base, innovation, research and development uptake in manufacturing limits the growth of modern methods of manufacturing in the country (Fine et al, 2012). The lack of knowledge, high cost and fear of change has led to low technology uptake. Lack of awareness on intellectual property rights hinders the development, registration and protection of new innovations in the manufacturing sector. There are limited technical and managerial skills; there is generally poor linkage between the industry and the training institutions.

Inadequate capacity of industries to meet product quality standards and ISO certification limits their efficiencies and product qualities (Fine et al. , 2012). This also makes consumers reluctant to trust these organizations and their products or services. Inefficient flows of goods and services: Inefficiency in the local transport and logistics sector (e.g. port, rail and road transport services), greatly hampers the ability of local manufacturers to access and be competitive in regional and global markets.

Weak Public Private Partnerships, the Government policy embraces the Private Sector as the engine for economic growth. Nevertheless, there is disharmony and a lack of constructive dialogue between the public and private sectors (Lall, 2004). This absence of partnership opportunities has contributed to skewed development initiatives, duplication of efforts and the development of policies that are not responsive to the needs of the Private Sector. Uncertainty in politics with unfortunate occurrences like the post-election violence of 2007 and the Westgate terrorist attack destroy industrial infrastructure physically, reduce morale and also deter foreign investment in Kenya.

Furthermore, the absence of what may correctly be seen as an “Industrialization Culture” in Kenya has inhibited growth and innovation in the sector. From a historical perspective there has hardly been any effort in locating national industrialization as a necessary and important political decision to be made at the highest level (Altenburg, and Lütkenhorst, 2015). Examples from other countries indicate how decisive political decisions led many countries to pursue extremely rewarding Industrialization policies. Japan for instance took the political decision in the 1960s and despite having no minerals, including oil, has proved to be a manufacturing powerhouse and an immense economy.

A major problem in Kenya has also been the fact that the operational industrial policies are contained in many disparate policy documents including Acts of Parliament, development plans and other sectoral policies and strategies some of which have been reviewed in the foregoing sections (Chang, 2009). The lack of a harmonized and clearly defined National Industrialization Policy has therefore negatively affected the process of industrialization and is compounded by the existence of numerous laws; a weak legal framework, as well as, overlapping ministerial mandates, all of which have culminated into an uncoordinated and slow pace of industrialization. Lack of clear boundaries on the mandates and functions of ministries and agencies has caused distortions in the value chain, weak sector policies, overlaps and conflicts in policy implementation.

The influx into the urban sector - although it comes with income gains for those who migrate - was not triggered by any significant industrialization in the classical sense and it is also not sustainable given the limited market size for informal products (Chang, 2009). Recent data, even after GDP adjustments which reflect some economic modernization, confirms what has been argued since a decade, that SSA is in a process of deindustrialization from an already low baseline (Arbache et al, 2008). The share of manufacturing industry was for many countries of SSA in the year 2015 smaller than in 1981, hovered at 10% of GDP, and never had the characteristic peak of industry found in most other world regions

Most small and micro firms do not grow into the modern formal sector and path-dependently operate at a very low level of productivity (Evans, 1995) as cited by (Altenburg and Lütkenhorst, 2015). If these trends continue, SSA will not be able to turn the demographic burden into a demographic gift or ‘dividend’. Africa’s workforce will grow between now and 2050 by another 500 million people, which all need productive jobs. High under- or unemployment will in turn slow down the awaited demographic transition, as especially for women a continuation of current trends would have little effect on their labour market participation and the number of desired children.

In consequence for Africa, bypassing manufacture and leapfrogging straight into the service age has become far less obvious, given lower employment prospects in the tertiary sector and given the fact that labour-intensive industries seem to move westwards, towards Africa indeed(Fine et al, 2012). Some industrial leapfrogging actually occurs in Africa, for instance in telecommunication and energy-generation, but refers to consumer and policy choices within the industrial sector itself.

Tomato production is important for small-landholder farmers in rural Uganda because tomatoes are a source of income and are widely consumed by Ugandans. Challenges of inadequate information on the horticultural practices formed the basis for this investigation. Cultivars, pesticide application, staking, and mulching were tested for their impact on tomato yield, disease severity and gross margin (Tusiime, 2014).

# CHAPTER THREE:

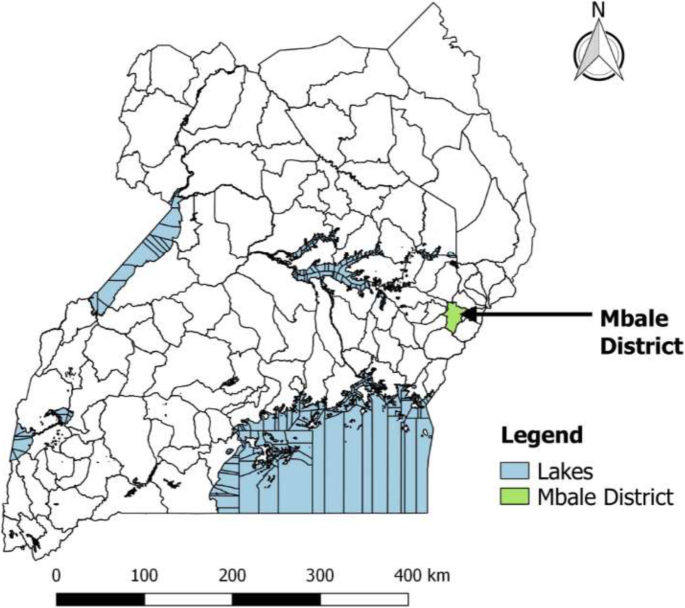
# METHODOLOGY

## 3.0Introduction

This chapter has discussed the research methodologies that were used in the study. It describes the research design, research process, method of data collection, method of data analysis, and the application of the data analysis.

## 3.1 Description of the Study Area

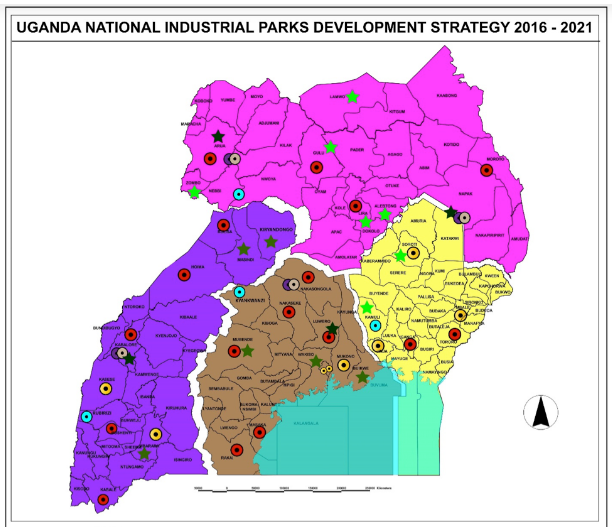
The researcher conducted the study from Bungokho Sub County in Mbale District which was situated in the eastern region of Uganda. The district lies between the longitudes of 34°E, 35°E and latitude 00°45°N with land area of 534.4 square Km and population density of about 620 persons per square Km.

(a)(b)

## **Figure 2: (a) Map of Uganda with Mbale District Location. (b) Location of Bungokho Sub-county**

**Source: Google Maps, (2017)**

Mbale district is bordered by Sironko district to the north, Bududa district to the Northeast, Manafwa district to the Southeast, Tororo district to the South, Butaleja District to the Southwest and Budaka district to the West. Pallisadistrict and Kumi district lie to the Northwest of Mbale district. Mbale district which is also the largest district in the Eastern region is approximately 245 Km by road Northwest of Kampala the largest city in Uganda.





**SOURCE:** Google maps, 2017

## **Figure**3: Distribution of Industries in Uganda

From figure 3, one can easily see the process of industrial growth in Uganda is taking fast development and in eastern Uganda and particularly in Mbale district, industrial growth is on the increase. The interpretation of this is that the future of agriculture, most especially tomato growing is threatened if the government does not plan very well for strategic locations of these industries.

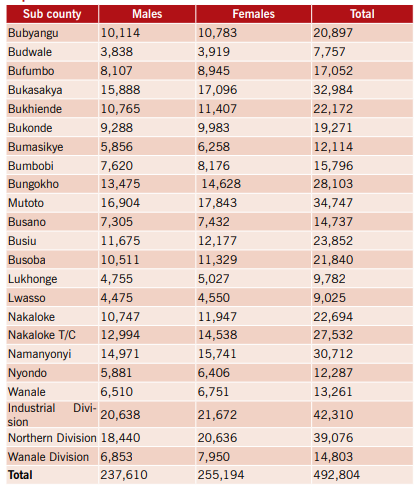
## 3.2 Research Design

This study was cross-sectional research design to assess the respondents’ views towards effect of industrial growth on small-scale farming in Bungokho sub-country, Mbale District. Both qualitative and quantitative approaches were used in this study in order to get a clear and in-depth insight into the subject matter. Agricultural officers, community leaders and peasant farmers who differ in interest, but share other characteristics such as socioeconomic status, educational background etc. composed the respondents of the study.

## 3.3Study Population

The study was conducted with the assistance of mainly individuals in Bungokho sub country inMbale. It included mainly small-scale tomato growers ranging from varied age groups. The target population was 200 whom included 190households and 10 key informants (agricultural officers in Mbale district and local leaders in Mbale and Bungokho sub country in particular who were engaged in tomato farming. These people were selected because they were believed to have sufficient information about the study topic.

## Table 1: Population Distribution of the Study Area



**Source: UBOS, (2014)**

As seen from table 1 above, the National Population and Housing Census of 2014 estimated the total population of Mbale district at 492,804 people and Bungokho alone constituted of 28,103 people among which 13,475 were males and 14628 were females. Mbale district is among the well mapped tourism potential areas in Uganda and with Mt. Elgon National Park, the district gives investors looking for opportunities in the tourism sector with a variety of ventures. Mountain hiking, eco-tourism, cultural tourism, bird sighting, lodgings, camping and the like are good areas for investment in the region (MAIF, 2018).

Additionally, the district has a gazetted industrial park, with an already existing industrial area. These position the area as a good place for investors willing to manufacture assorted products. This industrial background coupled with the areas’ location give the investor a good marketing network to the neighbouring Teso, Karamoja, and Bukedi regions and better still to Kenya. However, with increasing industrial growth, small scale farmers are getting pushed to the peripheries of their lands and most especially tomato growers are getting highly affected (Uganda Investment Authority, 2018).

## 3.4. Sample Size

Sample size determination is the act of choosing the number of observations or [replicates](http://en.wikipedia.org/wiki/Replication_%28statistics%29) to include in a sample in an empirical study in which the goal is to make [inferences](http://en.wikipedia.org/wiki/Statistical_inference) about a [population](http://en.wikipedia.org/wiki/Statistical_population) from a sample. The nature of data that has been generated required different techniques for better understanding of the research problem under investigation. Besides, the approach is also commonly known for achieving higher degree of validity and reliability as well as eliminating biases as per Amin (2015).

The study used Sloven’s formula to determine the sample size of the actual respondents. Sloven’s formula states:

Where;

n = 133 respondents

n = sample size

N = the population size

e = level of significance, fixed at 0.05

Out of the 133 questionnaires that were administered, only 130 were returned by the respondents giving a response rate of 98%.

## 3.5 Sampling Techniques

Non-probability sampling was used to select respondents for this study. Non-probability sampling is defined as a sampling technique in which the researcher selects samples based on the subjective judgment of the researcher rather than random selection. It is a less stringent method. The researcher used this sampling technique because of the ability to target particular groups of the population. Each group had different number of respondents, all of which meet the basic requirements based on the purpose of study.

## 3.6 Data Collection Instruments

## 3.6.1 Self-Administered Questionnaires

The study used a self-administered questionnaire. A questionnaire is a form consisting of interrelated questions prepared by the researcher about the research problem under investigation based on the objectives of the study. A questionnaire was used because it allowed in-depth research, to gain first-hand Information and more experience over a short period of time. The questionnaire consisted of closed ended prepared in English language and administered directly to selected respondents to fill. In cases where the respondents were not able to read and write the researcher assisted them by interpreting the rhetoric.

## 3.6.2 Interview Guide

The researcher organized key informant interviews with Agricultural Officers of the areas with the use of interview guides. The researcher therefore had to interact with the respondents, face to face and ask them relevant questions to the study. The tool was used purposely because it provided for a systematic flow of information due to the order of questions and it also helps in covering information that would be left out in the questionnaires.

## 3.7 Data Sources

## 3.7.1 Secondary Data

The study used secondary data from already published reports / books, University libraries, articles and Journals on small scale Agriculture and its mechanization etc.

## 3.7.2Primary Data

The Primary data was collected using questionnaires. Primary data was collected from the respondents through self-administered questionnaire. Primary data are important in answering questions about the study variables.

## 3.8 Data Management

It was important to emphasize to the quality of data in this study. To this effect, the researcher satisfied critical conditions of the requirements by ensuring validity and reliability as explained.

## 3.8.1 Data Analysis

Qualitative data was then analyzed thematically using descriptive master sheet analysis where data was cleaned, edited and coded. Quotations of some key informants were used to give the final report a deep and well-backed analysis. These are presented in a descriptive form. On the other hand, quantitative data was analyzed using computer packages of SPSS. This was done after cleaning the questionnaires and coding the answers given by the respondents. The coded answers were entered in SPSS and analyzed in line with the study objectives. The data was presented in form of frequencies, averages and other statistical diagrams as graphs and tables. To establish the relationships, the researcher employed the model summary and ANOVA to determine relationships between variables.

## 3.9 Validity and reliability of the Instrument

## 3.9.1 Validity of the Instrument

This instrument is mainly ensured through expert judgment and the researcher made sure the coefficient of validity to be at least 70%. After the assessment of the questionnaire, the necessary adjustments made bearing in mind of the objectives of the study. The researcher used the following formula to calculate the validity of the instrument was

## 3.9.2 Reliability of the Instrument

Reliability is a measure of the degree to which research instruments yield consistent results or data after repeated trials. The Cronbach’s reliability test was performed to ascertain the reliability of the instrument. Classification on quality of Cronbach’s Alpha value states that the value exceeding 0.9 is excellent, between 0.9 and 0.8 is good, 0.7 to 0.8 is acceptable, 0.6 to 0.7 is questionable and 0.5 to 0.6 is poor, and below 0.5 as unacceptable. The Cronbach’s results of both internal control and accountability should be between 0.75 and 0.8 respectively to be interpreted as acceptable.

## 3.10 Ethical Considerations

The researcher carried out the study with full knowledge and authorisation of the top authorities of Bungoko Subcounty, Mbale District. The researcher first of all acquired an introductory letter from Nkumba University which he used to introduce him self to the concened authorities and respondents for permission to carry out research in the area. The researcher thereafter went ahead to select respondents, and arrange for dates upon which he would deliver questionnaires. The researcher was charged with a task of ensuring that he would assure the respondents of their confidentiality as this was paramount to research.

## 3.11 Limitations of the study

Difficult in movements and information flows at a time of the pandemic with lock downs and curfew. Times have changed especially with the outbreak of the covid-19 pandemic whereby it’s now challenging to access public libraries where the researcher can find information and also difficult to travel study area. To overcome this, the researcher undertook to follow the standards Operations Procedures to access public libraries and people so as to get relevant information.

Some respondents were not cooperative enough that they at times refused to disclose some vital information which was relevant to the study due to the confidentiality that they owed to themselves.To overcome this, the researcher explained to them the purpose of study which is onlyfor academic purpose.

# CHAPTER FOUR:

# RESULTS AND DISCUSSIONS

## 4.0 Introduction

This chapter presents the findings from the study following different research questions. The chapter first gives summary of the respondents’ characteristics in terms of whether they were permanent or temporary following through the research questions. Data has been presented following the research objectives and research questions.

## 4.1 Demographic Characteristics of the Respondents

According to Koukoli (2002) defines social demographics are the characteristics of the population which include age, gender, education level, marital status, household income, religion among others. This study focused on the Age, Gender, Education Level and marital Status as the main demographic characteristics for data collection purposes.

## 4.1.1. Gender Distribution of Respondents

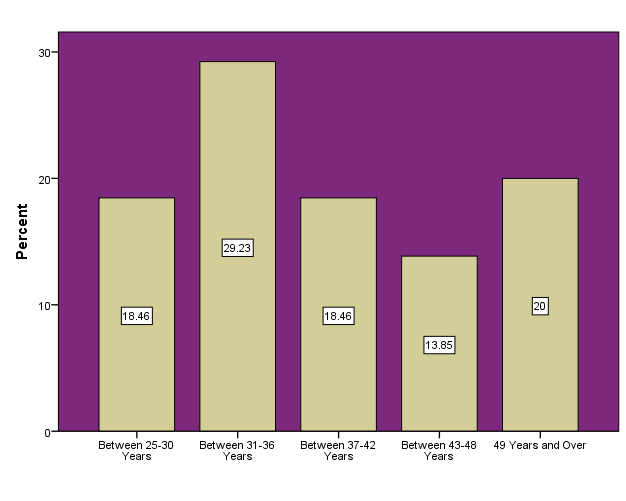
## Table 2: Gender Distribution of Respondents

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | Male | 95 | 73.1 | 73.1 | 73.1 |
| Female | 35 | 26.9 | 26.9 | 100.0 |
| Total | 130 | 100.0 | 100.0 |  |

**Source:** Primary data, 2021

There was a higher male participation in this study (73.1%) than the female respondents (26.9%) were because the males were more engaged in small-scale tomato farming than the females. The females were much involved in marketing than the males. This also indicates that tomato farming is mainly conducted by men since it involves energetic operations.

## 4.1.2. Age distribution of the respondents



## Figure 4: Age Distribution of the Respondents

**Source:** Primary data, 2021

The total number of respondents was 130 and the age category of those ranging between 31-36 years formed the largest number of respondents followed by those who were aged 49 years and above. The least category of respondents was those participants between 43-48 years and 25-30 years respectively. Age was very significant fact under consideration in this study as it assisted to identify the category of small-scale farmers actively participating in tomato farming. This implies that majority of the respondents were middle aged households with families who had to engage in small-scale farming of tomatoes to support their family members.

## 4.1.3Marital Status of the Respondents

## Table 3: Marital Status of the Respondents

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | Married | 88 | 67.7 | 67.7 | 67.7 |
| Single | 36 | 27.7 | 27.7 | 95.4 |
| Other | 6 | 4.6 | 4.6 | 100.0 |
| Total | 130 | 100.0 | 100.0 |  |

**Source:** Primary data, 2021

The study selected more married respondents (n=88, 67.7%) followed by the single ones (n=36, 27.7%) and the other marital status formed a minority group as seen in table 3. This implies that most of respondents were married households who had a lot of responsibilities to take care and therefore were forced to engage in small-scale farming of tomatoes.

## 4.1.4. Education Level of the Respondents



**Source:** Primary data, 2021

## Figure5: Level of Education of the Respondents

The majority of the respondents, 65 out of 130 had studied up to secondary school level and 41 respondents reached university. The number of primary school leavers and those who had no education at all was low. The fact that majority of the respondents were secondary school and university graduates shows that the findings of the study are very reliable and relevant to this study. This implies that most of the households in the district were averagely educated since they were at secondary school level and this shows that they were informed about industrial growth and small-scale tomato farming.

## 4.1.5. Residence of the Respondents

## Table 4: Type of Residence of the Respondents

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | Permanent Residence | 83 | 63.8 | 63.8 | 63.8 |
| Temporary Residence | 47 | 36.2 | 36.2 | 100.0 |
| Total | 130 | 100.0 | 100.0 |  |

**Source:** Primary data, 2021

From table 4, out of the 130 respondents who participated in this study, 83 representing 63.8% were permanent residents of Bungokho Sub-County while 47 respondents who accounted for 32.2% lived outside the Bungokho boundaries. As it was expected in this study, it was very important to use as many permanent residents as possible because they have stayed longer in the area and therefore know most of the issues and challenges facing the municipality as regards to industrial growth and tomato growing. This made it easy for the process of data collection to go on smoothly since these respondents had more knowledge on the subject matter and were willing to provide information.

## 4.2. Discussion of study findings in accordance with the study objectives

## 4.2.1. Findings on the economic contribution of tomato farming to the welfare of small scale growers in Bungokho Sub-County Mbale District.

In objective one, the researcher aimed at examining the economic contribution of tomato farming to the welfare of small scale growers in Bungokho Sub-County Mbale District. And the following results were generated in table 5;

## Table 5: Do you grow tomatoes for subsistence or commercial purposes

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | Grow for Subsistence | 8 | 6.2 | 6.2 | 6.2 |
| Grow for Subsistence and commercial purposes only | 41 | 31.5 | 31.5 | 37.7 |
| Grow for Commercial Purposes only | 71 | 54.6 | 54.6 | 92.3 |
| Other | 10 | 7.7 | 7.7 | 100.0 |
| Total | 130 | 100.0 | 100.0 |  |

**Source:** Primary data, 2021

As seen in table 5 small-scale farmers were to given their responses on their practice of farming either for subsistence or commercial purposes. Only 8 respondents (6.2%) grow tomatoes for domestic purposes while 41 respondents (31.5%) grow for both subsistence and commercial purposes. A very large number of respondents (N=71, 54.6%) are in position to grow for commercial purposes only. It can be revealed from this study that the large majority of small-scale farmers being engaged in growing tomatoes for saleare clear indication that the tomato crop is an economic vegetable crop which has the potential to elevate small-scale farmers out of poverty if they follow good agricultural practices.



## Plate 1: the Domesticated Tomato plant Grown in Bungokho Sub-County, Mbale District

(Source: field pictures, 2021)

The plate 3 above is a grown tomato plant that that was extracted from the internet to demonstrate the domesticated type of tomatoes grown in Uganda and other parts of the world. It shows the features of adaptation to the climatic conditions of the study area and it was also said to be among those being grown in Bungokho, Mbale district with the potential to give high yield.



## Plate 2: Tomatoes Ready for Harvest

**(**Source: field data, 2021**)**

From plate the plate 4 above, it can be shown that the tomato is a vegetable crop which can also be eaten as a fruit similar to the data in the literature review, tomatoes can be botanically defined as a fruit because they form flower and contains seeds. Still they are most often utilized as vegetable in cooking and in-fact the United States Supreme Court ruled in 1893 that the tomato should be classified as vegetable on the basis of its culinary applications.

## Table 6: Economic contribution of tomato growing to small-scale farmers

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | Less than 100,000= Per month | 5 | 3.8 | 3.8 | 3.8 |
| More than 100,000= Per Month | 23 | 17.7 | 17.7 | 21.5 |
| More than 150,000= Per Month | 50 | 38.5 | 38.5 | 60.0 |
| 200,000= and above | 52 | 40.0 | 40.0 | 100.0 |
| Total | 130 | 100.0 | 100.0 |  |

**Source:** Primary data, 2021

The study investigated the economic contribution of tomato growing towards small-scale farmers in Mbale district and the results in table 6 shows that many households are able to earn a decent living from the sale of tomatoes in the market. Only 5 respondents said that they are unable to earn more than 100,000/= in one month while the remaining participants are able to earn more than that. The study further reveals that the income from the tomato farming is very significant towards meeting their household needs which include food, paying for electricity and water bills as well as meeting the school fees requirements of their children.

## Table 7: Gender of Respondents Economic contribution of tomato growing to small-

## Scale farmers

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Count Cross tabulation | | | | | | |
|  | | Economic contribution of tomato growing to small-scale farmers | | | | Total |
| Less than 100,000= Per month | More than 100,000= Per Month | More than 150,000= Per Month | 200,000= and above |
| Gender of Respondents | Male | 5 | 22 | 50 | 18 | 95 |
| Female | 0 | 1 | 0 | 34 | 35 |
| Total | | 5 | 23 | 50 | 52 | 130 |

**Source:** Primary data, 2021

Majority of the small-scale farmers who participated in this study said that they grow tomatoes for economic gain and only spare little for subsistence. From table 7, gender and household income were cross-tabulated and the results that small-scale tomato farming favors the male gender more than the females. Much as the study also found much involvement of the female gender in activities such as ploughing, digging, planting and marketing of the tomato produce, it is clear that the male gender earns more from the activity than the females. This perhaps is attributed to other factors such as land ownership, farm size and time spent during planting, weeding and harvesting.

**Presentation of the results from the interviews conducted:**

*“………….I started growing tomatoes recently like 5 years back after realizing that my neighbours were economically prospering from the business which also encouraged me to join it, and I have gained some good incomes from it every season which help me on my tuition burden for my children”.(Interviewee 1)*

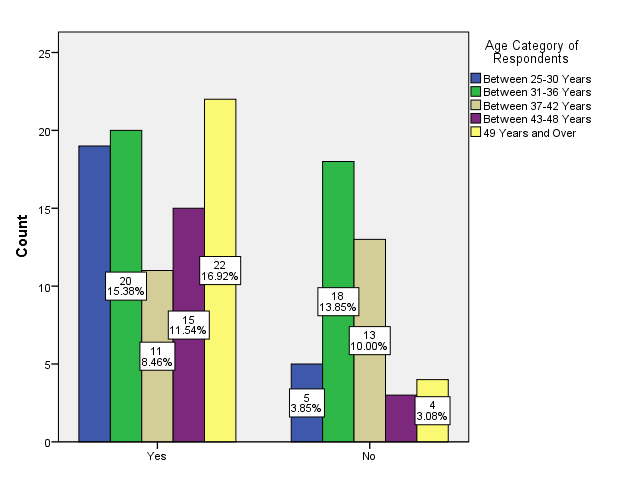
*“Tomato growing was our main occupation in this village unlike currently where the youths now have resorted to other small businesses and others working in the new industries emerging in the district. However, still for those of us who have remained this activity have gained economic benefits from tomato growing……..”(Interviewee 2&5)*

*“……..In Mbale we have a very broad market for our tomatoes, and this has encouraged us to plant more and more and it has indeed benefited us economically improving our lives and standards of living……”(Interviewee 6-8)*

*“……………….Tomato farming can generate high income for us than other crops because of the high market value of it, and it has given us providing employment and income especially during the long dry season…”(Interviewee 9-10)*

## 4.2.2. Findings on the effect of industrial activities on small-scale farming in Bungokho Sub-County Mbale District

In objective two, the researcher assessed the effect of industrial activities on small-scale farming in Bungokho Sub-County Mbale District. And the following results were generated below;



**Source:** Primary data, (2021)

## Figure 6: Has industrial growth affected small-scale tomato farming in Bungokho Sub-County?

The study factored in the aspect of age to try to determine whether industrial growth has had any significant effects on small-scale tomato growing in Bungokho Sub-county. The 49 year olds were the majority followed by 31-36 age groups. From figure 3, majorities of the respondents in the upper age categories agreed that industrial growth has indeed affected tomato growing in Bungokho Sub-county. Very small numbers and percentages across all the age groups declined to the effects of industrial growth on tomato growing. This therefore suggests that tomato growing as viewed from different age groups is an important economic activity generating a lot of income for many small-scale tomato growers in the area.

## Table 8: Ways through which industrial activities has affected small-scale tomato farming in Bungokho Sub-county, Mbale district

|  |  |  |  |
| --- | --- | --- | --- |
| Variables | Responses | | Percent of Cases |
|  | N | Percent |
| Reduced size of farming land space for factories | 10 | 7.6% | 7.6% |
| Affected soil fertility through toxic waste generation | 30 | 23.2% | 30.8% |
| Diverted farmers into other Business ventures | 31 | 23.6% | 54.4% |
| Some Farmers have abandoned tomato growing for other crops | 31 | 23.6% | 78.0% |
| Other | 28 | 22.1% | 100.0% |
| Total | 130 | 100.0% |  |

|  |
| --- |
| 1. Dichotomy group tabulated at value 1.   **(Source: Primary Data computed by the researcher, 2021)** |

The study reveals a number of ways through which industrial expansion has affected small-scale tomato farming in Bungokho Sub-county and some of the results are observed in table 8 above. A higher percentage (23.6%) said that industries as they flourish are diverting many farmers to take up other farming activities involving some other food crops while others have started businesses far different from tomato growing, something which threatens the future of small-scale tomato farming. 23.2% of the respondents reported that soil fertility being much more affected through toxic waste generation from industries.

**Presentation of the responses from the interviews conducted:**

*“……………..The growth of industries in our area has greatly proved to be a challenging to us the small scale farmer, in terms of soil pollution and toxic wastes, this has affected the short and long term of quality of the soil and yield”*

*“--- the challenge which we also have is we don’t have representative industries which can process our tomato raw materials as some other farmers have, specifically those who grow maize and cassava. This forces us to grow those crops instead of tomato—“*

*“---- it was also revealed that land grabbing by some rich investors in some areas which is a problem and this has caused migration of some small-scale farmers to other areas where they ended up growing other crop ----“*

## 4.2.3.1. Analysis of the Variance (ANOVA) for the independent and dependent Variables

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Table 9: ANOVA** | | | | | | |
|  | | Sum of Squares | Df | Mean Square | F | Sig. |
| Reduced size of farming land space for factories | Between Groups | .657 | 1 | .657 | 3.026 | .084 |
| Within Groups | 27.774 | 128 | .217 |  |  |
| Total | 28.431 | 129 |  |  |  |
| Affected soil fertility through toxic waste generation | Between Groups | .636 | 1 | .636 | 61.046 | .000 |
| Within Groups | 1.333 | 128 | .010 |  |  |
| Total | 1.969 | 129 |  |  |  |
| Diverted farmers into other Business ventures | Between Groups | .000 | 1 | .000 | . | . |
| Within Groups | .000 | 128 | .000 |  |  |
| Total | .000 | 129 |  |  |  |
| Some Farmers have abandoned tomato growing for other crops | Between Groups | .000 | 1 | .000 | . | . |
| Within Groups | .000 | 128 | .000 |  |  |
| Total | .000 | 129 |  |  |  |
| Other | Between Groups | 5.540 | 1 | 5.540 | 360.369 | .000 |
| Within Groups | 1.968 | 128 | .015 |  |  |
| Total | 7.508 | 129 |  |  |  |

**(Source: Primary Data computed by the researcher, 2021)**

A one way analysis of variables was conducted and the results are shown in the table 9 above. It can be shown that two variables proved to be statistically significant and were much more associated with industrial growth. These included reduction of farming land space for growing tomatoes as factories demanded larger space for their establishment and this had a significant value of 0.084 (P-value< 0.05). The other variable was effect on soil fertility through toxic waste generation which had a statistical value of 0.000 (P-value< 0.05). The study further found out that there were also other factors that significantly affected small-scale tomato growing and these also had proven statistical values (P –value = 0.000 < 0.05).

In relation to the theories that informed this study, the economic growth theory did not suit the results well because its concepts as seen in table 9 affect farmers directly as it favors capitalism and ignores other sectors such as agriculture. Therefore the planners cannot rely on it so much if the future of tomato farming is to remain viable in the country. For instance three variables were significantly indicative of the dangers of industrial growth, i.e. affecting soil fertility through toxic waste generation with (F= 61.046 and P- value = 0.000 < 0.05) and diverting farmers into other business ventures as well as farmers abandoning tomato growing for other crops (F = 360.369 and P-value =0.00 < 0.05) already shows that industrial growth has negative consequences on farming.

In the authors view, the results of this study can well be appropriately informed by the unified growth theory, and the endogenous growth theory, which require planners to consider all the sectors of the economy in their development agenda. In this case, since tomato growing represents a fraction of the agricultural sector, but also its outcomes benefit other sectors such as industry, where it provides raw materials and food, therefore, more land should be spared to boost farmers and expand their production.

Comparing the unified growth theory and the endogenous growth theory, one can argue that although both theories support growth, the endogenous growth theory offers a better explanation of the results obtained in this study. The endogenous growth theory states that; growth of an economy is as result of all the internal forces, rather than the external ones. This means that a country’s internal sectors or businesses need to be supported more other than the external ones, which emerge as a result of investors coming from abroad. Because these investors who come from abroad look at maximizing profits and repatriating all the funds to their countries, ignoring the dangers of their investments on the economy and the environment that they thrive in, therefore farming ventures such as small-scale tomato growing is likely to be highly affected by such investments.

In the author’s opinion, the unified growth theory though it supports growth of all sectors simultaneously, it remains silent about who, how, where and when this investment can be undertaken. Therefore, this study shows that the endogenous growth theory offers a better and clearer explanation of the future of small-scale tomato growing in Uganda at large.

## 4.2.3. Findings on the factors apart from industrial growth which constrain small-scale tomato farming in Bungokho Sub-County Mbale District

In objective three, the researcher determined the factors apart from industrial growth which constrain small-scale tomato farming in Bungokho Sub-county Mbale District. And the results are as presented here under:

## Table 10: Lack of Improved seeds

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | Yes | 20 | 15.4 | 15.4 | 15.4 |
| No | 92 | 70.8 | 70.8 | 86.2 |
| N/R | 18 | 13.8 | 13.8 | 100.0 |
| Total | 130 | 100.0 | 100.0 |  |

**Source:**Primary data (2021)

The study found out that lack of improved seeds was not a serious issue among small-scale tomato farmers. the respondents show that majority of them reported having no challenge with having good quality seeds while only 18 respondents did not give any response as seen in table 10. This implies that most of the tomato farmers were having access to good quality seeds and this positively impacted their overall productivity.

## Table 11: Shortage of Labor

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | Yes | 54 | 41.5 | 41.5 | 41.5 |
| No | 62 | 47.7 | 47.7 | 89.2 |
| N/R | 14 | 10.8 | 10.8 | 100.0 |
| Total | 130 | 100.0 | 100.0 |  |

**Source:** Primary data (2021)

Labor is a factor of production and in tomato farming, it is one of the most significant factors that influence tomato production and from table 11 above, 47.7% of the respondents reported having no labor challenges while 41.5% seem to face difficulties in labor acquisition. From the results in table 11, it is clear that some farmers are facing serious challenges due to labor mainly because they use elementary tools for planting and weeding.

## Table 12: Unreliable Climate Information

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | Yes | 100 | C | 76.9 | 76.9 |
| No | 14 | 10.8 | 10.8 | 87.7 |
| N/R | 16 | 12.3 | 12.3 | 100.0 |
| Total | 130 | 100.0 | 100.0 |  |

**Source:**Primary data (2021)

The climate is an important factor that seriously affects crop growth with its associated elements such as temperature, wind direction, rainfall distribution, among others. From this study as seen in table 12, it has been revealed that small-scale farmers have limited access to weather information which makes it difficult for them to predict their harvest and also plan for their incomes.

## Table 13: Inadequate Extension Services

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | Yes | 41 | 31.5 | 31.5 | 31.5 |
| No | 53 | 40.8 | 40.8 | 72.3 |
| N/R | 36 | 27.7 | 27.7 | 100.0 |
| Total | 130 | 100.0 | 100.0 |  |

**Source:** Primary data (2021)

Farmers need extension services of government such as knowledge of application of fertilizers, post-harvest handling, spraying, planting and storage. However, from the results of this study, a significant percentage of farmers (31.5%) do not have quick access to these services which constrains them on how to manage tomato farming as a business activity as seen in table 13.

**Presentation of the responses from the interviews conducted:**

*“……………..as tomato farmers, we face a number of challenges including the varying market of our tomatoes, the uncertainties in prices of our produces, the pests and diseases which also deprives us and many more……..”*

*“……..It has always been a challenge for some of us who wish to grow tomatoes on large scale but when we don’t have access to land in our areas and instead we own small plots which limit our visions and passion for tomato farming…..”*

*“………We have a problem of pests and many other diseases that affect our tomato plants regardless of using various varieties that are said to be good and resistant, and we receive no aid from our leaders and the government at large which have real scared us, making others to abandon the business due to high risks and losses experienced in some seasons……”*

## 4.2.3.1. Bayesian Estimates of Coefficients between the factors apart from industrial growth and small-scale tomato farming in Bungokho Sub-County Mbale District

## Table 14:Bayesian Estimates of Coefficients a,b,c

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Posterior | | | 95% Credible Interval | |
| Mode | Mean | Variance | Lower Bound | Upper Bound |
| (Intercept) | .785 | .785 | .004 | .659 | .912 |
| Lack of Improved seeds | .063 | .063 | .002 | -.025 | .152 |
| Shortage of Labor | .015 | .015 | .001 | -.051 | .080 |
| Unreliable Climate Information | .172 | .172 | .001 | .098 | .247 |
| Inadequate Extension Services | -.064 | -.064 | .001 | -.139 | .012 |
| a. Dependent Variable: Small-scale tomato farming in Bungokho sub-county, Mbale district. | | | | | |
| b. Model: (Intercept), Lack of Improved seeds, Shortage of Labor, Unreliable Climate Information, Inadequate Extension Services | | | | | |
| c. Assume standard reference priors. | | | | | |

***Source:****Primary data (2021)*

## Table 15: Bayesian Estimates of Error Variance a

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Posterior | | | 95% Credible Interval | |
| Mode | Mean | Variance | Lower Bound | Upper Bound |
| Error variance | .032 | .033 | .000 | .025 | .042 |
| a. Assume standard reference priors. | | | | | |

**Source:***Primary data, 2021*

The study further considered the analysis of the Bayesian estimate of Coefficients to determine whether there were other factors which affected small-scale tomato growing as seen in table 14and also analyzed its error of the variance as seen in table 15. It was revealed that small-scale tomato growing was again highly dependent on other factors other than industrial growth. Un-reliable climate which showed a mean vale of 0.172 was the most significant factor that mostly affected tomato growing, followed by lack of improved seeds(mean-value=0.063) and shortage of labor (mean=0.015). This means that at 95% confidence interval, the results of this study confirm that industrial growth is not the most outstanding factor constraining small-scale farmers but other factors also exists.

## Table 16:ANOVA for the factors apart from industrial growth

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | | Sum of Squares | Df | Mean Square | F | Sig. |
| Lack of Improved seeds | Between Groups | 6.485 | 1 | 6.485 | 26.367 | .000 |
| Within Groups | 31.484 | 128 | .246 |  |  |
| Total | 37.969 | 129 |  |  |  |
| Shortage of Labor | Between Groups | .596 | 1 | .596 | 1.384 | .242 |
| Within Groups | 55.097 | 128 | .430 |  |  |
| Total | 55.692 | 129 |  |  |  |
| Unreliable Climate Information | Between Groups | 17.046 | 1 | 17.046 | 48.836 | .000 |
| Within Groups | 44.677 | 128 | .349 |  |  |
| Total | 61.723 | 129 |  |  |  |
| Inadequate Extension Services | Between Groups | 7.088 | 1 | 7.088 | 12.529 | .001 |
| Within Groups | 72.419 | 128 | .566 |  |  |
| Total | 79.508 | 129 |  |  |  |

***Source:*** *Primary data, (2021)*

From the analysis of variables, (One Way ANOA) table 16 reveals that other than industrialization, three variables were statistically significant and affected small-scale tomato growing and these were (a) lack of improved seeds (P = 0.00 < 0.05, F =26.367); (b) unreliable climate information (P= 0.000 < 0.05, F 48.836); (c) inadequate extension services (P= 0.001 < 0.05, F 12.529). This study therefore shows that the existence of a number of factors affecting small-scale tomato growing compounded with industries poses major implications on the future of the farmers engaged in small-scale tomato growing which calls for major interventions from both the government and other relevant stakeholders.

## 4.2.4. Findings on the mechanisms adopted by small scale farmers to minimize the effect of industrial growth on tomato farming in Bungokho Sub-County Mbale District

In objective four, the researcher investigated mechanisms adopted by small scale farmers to minimize the effect of industrial growth on tomato farming in Bungokho Sub-County Mbale District. And the following results are as presented here under:

## Table 17: mechanisms adopted by small scale farmers to minimize the effect of industrialgrowth on tomato farming

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | | Frequency | Percent | Cumulative Percent |
| Valid | Accessed credit facilities to purchase land elsewhere | 11 | 8.5 | 8.5 |
| Formed farmer associations to raise their voices | 27 | 20.8 | 29.2 |
| Negotiated with industrial developers to address land pollution issues | 74 | 56.9 | 86.2 |
| Other | 18 | 13.8 | 100.0 |
| Total | 130 | 100.0 |  |

**(Source: Primary Data)**

“We are trying to negotiate with the management of some industrial proprietors to strike a deal because our soils are losing fertility. “A lot of effluents are continuously oozing out of the factories into our farms in form of leachate and the fertility of the soil is much affected. It has also affected tomato growth as the harvests have further reduced when industries started to flourish near our farm lands”.

**Presentation of the responses from the interviews conducted:**

*“…….As Tomato farmers we are trying to make sure that we balance the macro- and micro-nutrients in the soil to create an ideal soil environment that will support our plant growth and development……”*

*“……..I always employ various crop rotations and integrate crop and livestock enterprises to maintain soil fertility and to manage agricultural pests……”*

*“………..some of us are using cover crops and catch crops, which yield no marketable product, but make the farming systems as a whole work more effectively…….”*

## 4.3. Relationship between Variables

## 4.3.1. The Relationship of industrial growth and small-scale tomato farming in Bungokho sub-county in Mbale District, Uganda

Model Summary of the relationship of industrial growth and small-scale tomato farming

## Table 18: Model Summary of the relationship of industrial growth and small-scale tomato farming

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Model Summary** | | | | |
| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
| 1 | .731a | 534. | .533 | .36831 |
| 1. Predictors: (Constant), Industrial growth   *source: Primary data (2021)* | | | | |

## Table 19: showing ANOVA regression analysis between industrial growth and small-scale tomato farming

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **ANOVAa** | | | | | | |
| Model | | Sum of Squares | Df | Mean Square | F | Sig. |
| 1 | Regression | 14277.678 | 1 | 14277.678 | 3489.018 | .000b |
| Residual | 237.346 | 58 | 4.092 |  |  |
| Total | 14515.024 | 59 |  |  |  |
| a. Dependent Variable: Small-Scale tomato Farming | | | | | | |
| b. Predictors: (Constant), Industrial growth | | | | | | |

***Source:****Primary data (2021)*

From table 18, a regression analysis was run to determine the relationship between industrial growth and its effect of small-scale tomato farming in Bungokho sub-county. The analysis resulted into R square value of 0.534 and an adjusted R square value of 0.533. This was interpreted to mean that industrial growth contributed an effect of 53% towards small-scale farming and remaining 47% which was not accounted was a contribution from other factors.

## Table 20: showing ANOVA regression analysis between industrial growth and small-scale tomato farming

| **ANOVAb** | | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| Model | | Sum of Squares | Df | Mean Square | F | Sig. |
| 1 | Regression | 2.116 | 1 | 3.318 | 14.866 | .000a |
| Residual | 71.514 | 268 | .341 |  |  |
| Total | 74.622 | 251 |  |  |  |
| a. Predictors: (Constant), Small-Scaletomatofarming | | | |  |  |  |
| b. Dependent Variable: Industrialgrowth | | | |  |  |  |

***Source:****Primary data (2021)*

The ANOVA Table 20indicates a positive significant effect of industrial growth with small scale tomato farming in Bungokho sub-county in Mbale District, Uganda shown by (F-value=14.866 and Sig-value=.000). This is because the sig. value (0.000) was less than 0.05 which is the maximum level of significance required to declare a significant effect (decision rule). This showed that Industrial Growth affects Small Scale Tomato Farming in Bungokho Sub-county in Mbale District, Uganda. Still this implied that industrial growth can lead to low productivity of small scale tomato farming in Bungokho sub-county in Mbale District, Uganda and vice versa holding other factors constant.

Hence, it can be concluded that industrial growthhad an effect on small scale tomato farming in the sampled Bungokho sub-county in Mbale District, Uganda considering the standard error of; (β=0.484, Sig=0. 000)**.** Thus, Industrial Growthhas a significant effect on Small Scale Tomato Farming in the sampled Bungokho sub-county in Mbale District, Uganda.

# CHAPTER FIVE:

# SUMMARY, CONCLUSSION AND RECOMMENDATIONS

## 5.0 Introduction

This chapter presents the conclusive statements drawn from the findings and then some recommendations to mitigate the issues that arise and affect small-scale tomato farming in Bungokho sub-county, Mbale district and in Uganda in general.

## 5.1. Discussion of findings

## 5.1.1. The economic contribution of tomato farming to the welfare of small scale growers in Bungokho Sub-county, Mbale District

The study found out that tomato growing in Bungokho Sub-county, Mbale district is a lucrative activity for many youths and the activity also employs a number of un-employed women and men who eke a living from the sale of tomatoes in the market. It asserts that tomato growing has changed the lives of many small-scale farmers through the incomes they generate.

The findings are in line with (Akemo and Kyamanywa, 2001). Who asserted that in Uganda, tomatoes are produced in different agro-ecological zones through commercial as well as small scale farmers both as a source of income as well as food. However, the type is limited to few crops and production is concentrated to some pocket areas. While, Altenburg and Lütkenhorst, (2015) asserted that despite the ups and downs observed, the demand for tomato farming especially for export is increasing. Similarly, Amin, (2005) had it that it has been widely demonstrated that rural women, as well as men, throughout the world are engaged in a range of productive activities essential to household welfare, agricultural productivity, and economic growth. Tomatoes are grown in many parts of the world contributing significantly to income security and the nutritive diet of many households.

## 5.1.2. The effect of industrial activities on small-scale tomato farming in Bungokho Sub-County, Mbale District

The study also found out that industrial growth has in many ways affected small-scale tomato growing in Bungokho Sub County, Mbale district, ranging from; loss of viable space for growing tomatoes, instead being taken up by industrial growth. That’s industries pollute the soil through generation of toxic waste which degrades fertility of the tomato growing space hence leading to low productivity in some areas.

The findings were consistent with Arbache et al, (2008) who found that iindustrial growth also has resulted in an agriculture that degrades natural resources, depletes human resources, and destroys economic opportunities. An industrial agriculture is inherently incapable of maintaining its productivity and usefulness to society. It fails every test of sustainability. Further, Beegle, (2016) asserted that industrial agriculture also is a significant contributor to the depletion of social energy. Tomato Farm workers today are among the lowest paid workers in the U.S., while working under dangerous and disagreeable conditions, most without adequate health care or other fringe benefits

WhileCavana et al, (2001) said that monoculture exhausts soil fertility, requiring costly applications of chemical fertilizers. In addition, soils used to grow annual row crops and then left bare for much of the year have poor drought resistance, increasing irrigation costs. Furthermore, monoculture degrades soil structure and leaves it more vulnerable to erosion, resulting in costs for soil replacement, clean up, and lost farmland value (Arbache et al, 2008).

## 5.1.3. The factors apart from industrial growth which constrain small-scale tomato farming in Bungokho Sub-county Mbale District

The study further found out that apart from industrial growth, other factors have also affected tomato growing including but are not limited to; lack of improved seeds, shortage of labour for farm field activities, un-reliable climatic information which makes the farmers to fail to follow their planting calendar, post-harvest loses, and inadequate extension services to the poor small scale tomato growers.

The study findings are in accordance with Kebede (2002), privatization of land would seem to be the most effective way to reduce insecurity associated with the tenure schemes and uncertainties created by state ownership. Equally important, in terms of access to additional land, is proper management of the existing one. Further, according to Kimaru and Jama (2005), in East Africa sustained gains to agricultural productivity are threatened by land degradation, especially land erosion and loss of fertility. A number of programs during the past several decades were implemented by the Swedish International Development Agency and other development partners with a view to preserve the agricultural land in the region. The study found that clear land-use and agricultural policies need to be developed to provide a framework for researchers, extension workers and smallholder farmers on environmentally-sensitive practices. Nevertheless, the lack of clarity of property rights and un-equitable access to land exacerbate the land degradation problem.

While Adenuga et al, (2013) noted that, smallholder agriculture in the Africa countries studied has been facing numerous constraints. While some are unique to each of the countries, most are of a similar nature, implying that common solutions would address them across countries. The constraints discussed below are not new, but rather long-standing and perhaps even chronic. In addition to smallholder farmers, the constraints to some extent also impact large-scale or plantation farmers.

And a study conducted by Yeboah (2011) indicated about 76% of farmers and traders in Brong Ahafo region of Ghana complained of bad roads affecting their business. The bad state of road infrastructure makes it very difficult, expensive and time consuming to transport harvested produce to marketing centres.

## 5.1.4. The mechanisms adopted by small scale farmers to minimize the effect of industrialgrowthon tomato farming in Bungokho sub-county

The study found out that small-scale tomato growing in Bungokho Sub County have addressed some of their challenges through; accessing credit to purchase land elsewhere, some have formed associations to raise their voices while others have made necessary strides to negotiate with industrial developers to address the issues relating to soil pollution.

The findings conquer with Beegle, (2016) findings who asserted that there is need for sustainable tomato farmers to focus more directly on the health and productivity of their crops and animals. In agreement, Cavana et al, (2001) put that they should use various crop rotations and integrate crop and livestock enterprises to maintain soil fertility and to manage agricultural pests. They should use cover crops and catch crops, which yield no marketable product, but make the farming systems as a whole work more effectively. While Beegle K, (2016) continued that, they should attempt to select varieties of crops and breeds of livestock that fit their particular farms' soils, topography, and climate and their particular approach to farming. Sustainable farmers understand that healthy crops and livestock are just one link in the value chain of a sustainable food system (Beegle K, 2016).

## 5.2 Conclusions

## 5.2.1. The economic contribution of tomato farming to the welfare of small scale growers in Bungokho Sub-County Mbale District

The study concludes that tomato growing in Bungokho Sub-county, Mbale district is a lucrative activity for many youths and the activity also employs a number of un-employed women and men who eke a living from the sale of tomatoes in the market. It asserts that tomato growing has changed the lives of many small-scale farmers through the incomes they generate.

## 5.2.2. The effect of industrial activities on small-scale tomato farming in Bungokho Sub-County, Mbale District

The study also concludes that industrial growth has in many ways affected small-scale tomato growing in Bungokho Sub County, Mbale district, ranging from; loss of viable space for growing tomatoes, instead being taken up by industrial growth. That’s industries pollute the soil through generation of toxic waste which degrades fertility of the tomato growing space hence leading to low productivity in some areas.

## 5.2.3. The factors apart from industrial growth which constrain small-scale tomato farming in Bungokho Sub-County Mbale District

The study concludes that apart from industrial growth, other factors have also affected tomato growing including but are not limited to; lack of improved seeds, shortage of labour for farm field activities, un-reliable climatic information which makes the farmers to fail to follow their planting calendar, post-harvest loses, and inadequate extension services to the poor small scale tomato growers.

## 5.2.4. The mechanisms adopted by small scale farmers to minimize the effect of industrialgrowth on tomato farming in Bungokho sub-county

The study concludes that small-scale tomato growing in Bungokho Sub-County have addressed some of their challenges through; accessing credit to purchase land elsewhere, some have formed associations to raise their voices while others have made necessary strides to negotiate with industrial developers to address the issues relating to soil pollution.

The study further concludes that some famers have addressed some of their challenges through; accessing credit to purchase land elsewhere, some have formed associations to raise their voices while others have made necessary strides to negotiate with industrial developers to address the issues relating to soil pollution.

## 5.3. Recommendations

## 5.3.1. The economic contribution of tomato farming to the welfare of small scale growers in Bungokho Sub-County Mbale District

The study recommends that the government of Uganda in collaboration with the local community leaders should avail effective agriculture extension services and encourage farmers to take part as these would help them to acquire new skills and knowledge to enable them benefit more from the exercise.

The study further recommends small scale farmers in Bungokho Sub-County, Mbale to embrace the act of working in groups as this will help them to overcome the financial constraints on top of acquiring large pieces of land for their tomato growing activity. This will thus overcome the issues of land shortage and market inconsistencies for their tomato produce, hence benefit highly from their exercise.

Small-scale tomato growers should form agricultural associations to afford them access financial credit to support them in tomato growing and to acquire farm inputs such as fertilizers, improved seeds, tractors among others.

## 5.3.2. The effect of industrial activities on tomato farming in Bungokho Sub-County Mbale District

The Uganda Investments Authority should locate all industries in one location in industrial parks to prevent mushrooming factories that consume agricultural space most especially for tomato growing if it is to remain competitive with other agricultural crops.

Further, the study recommends that, there is an urgent need to identify national priority issues for investigation to support an effective response to the negativities of industrial growth onto small scale farmers within Uganda and such research and knowledge generation is an area that surpasses agriculture constraints affecting tomato growers in Bungokho Sub-County, Mbale district.

Lastly, Investors in the vicinity of tomato growers should continuously engage tomato growers for dialogue and co-operate together in order to prevent conflict.

## 5.3.3. The factors apart from industrial growth which constrain small-scale tomato farming in Bungokho Sub-County Mbale District

The study also recommends the need for strong leadership in concerned institutions like NFA, NEMA, UFA, NAADS and Ministry of Agriculture among others, with the power to influence across the sectors, and determination to tackle the agriculture constraints will be required to respond effectively to other factors like; climate change, lack of extensions, among others which is at the moment lacking.

## 5.3.4. The mechanisms adopted by small scale farmers to minimize the effect of industrialgrowthon tomato farming in Bungokho sub-county

The study recommends that the government of Uganda through the ministry of Agriculture, Animal Industry and Fisheries should address the challenges affecting small scale tomato growing and provide tomato growers for agricultural extension services.

Strong leadership is also needed within the development partners on agriculture development. Donors are beginning or gearing up to support agriculture in part to service political imperatives rather than articulated demand in Uganda. Despite the development of a Joint Assistance Strategy, donor action on agriculture mechanization has to date been disparate and uncoordinated and has bypassed coordination mechanisms such as sectoral working groups, which themselves have yet to develop a collaborative response on agriculture issues in the country.

## 5.4. Recommendations for Future Research

The future scholars should focus on the following considerations:

* Climate changes and Tomato yields in Mbale district of Uganda
* Seasonality rainfall variability and tomato growing in Uganda
* Pest controls and tomato growing in Mbale district of Uganda
* NAADS programme and tomato growing in Mbale district of Uganda

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## Appendix I: Questionnaire

I am ABDIRAHMAN MUSTAF ABDULLAHI, a student of Nkumba University pursuing a degree of Master of Science in Natural Resource Management. As a requirement to complete this course, I am conducting a research study entitled ***“The effect of industrial growth on small-scale tomato farming: A case of* Bunghoko *in Mbale District, Uganda”.*** You have been selected to participate in this study by providing the most correct and appropriate information to this questionnaire. All the views that you will provide will only be used for academic purposes and will not in any way be used against you.

Thank you for your cooperation.

**DEMOGRAPHIC DATA**

Note: for each of the following, tick against your response or write your response in the blank space provided.

1. Gender

a) Male

b) Female

2. Age category

a) Between 25-30

b) Between 31-36

c) Between 37-42

d) Between 43-48

e) Between 49- Above

3. Highest level of Education attained

a) Primary level

b) Secondary Level

c) Tertiary

d) University level

e) Others (specify)…………………………………………………

4. Marital status

a) Married;

b) Single

c) Bisexual

c) Other (specify)…………………………………

5. Type of Respondent.

a) Permanent Resident

b) Temporary Resident

Section B; the economic contribution of tomato farming to the welfare of small scale growers

6. Do you participate in small-scale tomato growing in this area?

a) Yes

b) No

7. If yes to Qn 6 above, do you grow tomatoes for subsistence of for economic gains?

1. Grow tomatoes for subsistence only
2. Grow tomatoes for commercial purposes only
3. Grow tomatoes for both subsistence and commercial purposes
4. Other

8. Does tomato growing have any economic contribution to the development of small scale farmers?

a)Yes

b) No

9) If yes estimate the economic gain from small-scale tomato growing per household in one month.

1. Less than 100,000/=
2. More than 100,000/=
3. More than 150,000/=
4. More than 200,000/=

**Section C:** the effect of industrial activities on small-scale farming

10) Has industrial activities effected on small–scale farming?

a)Yes

b) No

11) If yes, in which way has industrial activities small-scale tomato farming?

a) Reduced size of farming land

b) Affected soil fertility through toxic waste generation

c) Diverted farmers into other Business ventures

d) Some Farmers have abandoned maize growing for other crops

e) Other

11) What are the factors apart from industrial growth which constrain small-scale tomato farming

1. Lack of Improved seeds
2. Unreliable climate information
3. Lack of funds
4. Inadequate extension services

**Section D:** mechanisms adopted by small scale farmers to minimize the effect of industrial growth on tomato farming.

1. Accessed credit facilities to purchase land elsewhere
2. Formed farmer associations to raise their voices
3. Negotiated with industrial developers to address land pollution issues
4. Other

## Appendix II: Interview Guide

1. What is the economic contribution of tomato farming to the welfare of small scale growers?
2. What are the effects of industrial activities on small-scale tomato farming?
3. What are the other factors apart from industrial growth which constrain small-scale tomato farming?
4. What are mechanisms adopted by small scale farmers to minimize the effect of industrial growth on tomato?

## Appendix III: University Introductory Letter