ANALYSIS OF CAPACITY DEVELOPMENT NEEDS TOWARD CROP PRODUCTIVITY IMPROVEMENT: A CASE OF VEGETABLE FARMERS IN MLALI VILLAGE, MVOMERO DISTRICT

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CERTIFICATION

The undersigned certifies that she has read and hereby recommends for acceptance by the Open University of Tanzania, a dissertation entitled; **"Analysis of capacity development needs toward crop productivity improvement: A case of vegetable farmers in Mlali Village, Mvomero District"** in partial fulfilment of the requirements for the degree of Master of Project Management (MPM).

…….

Dr. Janeth Isanzu

(Supervisor)

……..

Date

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DECLARATION

I, **Lilanga Saku**, declare that, the work presented in this dissertation is original. It has never been presented to any other University or Institution. References have been supplied where other people's work has been used. In this regard, I declare that this is my unique work. It is hereby submitted in partial fulfillment for the Degree of Master of Project Management (MPM).

……..……
Signature

06/10/2023
……..……
Date

DEDICATION

I dedicate this work to my beloved parents, the late Mr. Saku Lilanga Nyamandito and Mrs. Ruth Simon Lyashanwa, my loved wife Anna Absalom Limbe, my beautiful daughter Ruth and my supervisor Dr, Janeth Isanzu. I appreciate all your support and motivation for my studies.

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I thank the almighty God for the courage, strength, guidance, patience and passion throughout my study period, for I understand without God, I could not be able to accomplish this study.

Sincere gratitude and acknowledgement is hereby made to my supervisor Dr. Janeth Isanzu for the valuable guidance, advice and encouragement. I would like to express my acknowledgement to my beloved parents, wife and friends who encouraged me to finish my study.

God Bless You All.

ABSTRACT

This study examined the development needs of vegetable farmers in Mlali village. The specific objectives of this study were: to identify the needed training of vegetable farmers to improve crop productivity; to determine the contribution of human capital investment through training of vegetable farmers toward crop productivity improvement; and to examine the contribution of diffusion of innovation toward crop productivity improvement. The study utilized Human Capital Theory to explore the relationship between human capital investment and the expected productivity, while diffusion of Innovation theory used to understand the acceptance or rejection of new technologies or capacities. The target population was 170 vegetable farmers from Mlali village. The sample size of 119 derived from the Yamane (1967) formula. The study used simple random sampling techniques. The research tool used was a structured questionnaire. Data analysis conducted to generate descriptive and inferential statistics through regression models. The findings of the study revealed that vegetable farmers in Mlali village had the most emphasized training need on accessing marketing information, followed by fertilizer use, pest and disease control, planting methods and irrigation. Furthermore, the study found training and diffusion of innovation had a statistically small positive significant correlation on crop productivity improvement. The study therefore concluded that training and diffusion of innovation contribution to crop productivity improvement was evident though it was small. The study recommended more research to identify specific training needs of farmers, implement them effectively, and replicate the study in other vegetable crop growing area in Tanzania. Encouraging and strengthening regular visits by extension officers, accompanied by demonstration plots recommended.

Keywords: *Vegetable Farmers, Training Needs, Diffusion of Innovation, Crop Productivity Improvement.*

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LIST OF ABBREVIATIONS AND ACRONYMS

DoI	Diffusion of Innovation
FAO	Food and Agriculture Organization
FBM	Faculty of Business Management
HCT	Human Capital Theory
NGOs	Non-Government Organizations
NSCA	National Sample Census of Agriculture
SA	South Africa
SI	Social Institutions (Enabling Environment)
SSA	Sub-Saharan African
SPSS	Statistical Packages for Social Science
UNDAF	United Nations Development Assistance Framework
UNDG	United Nations Development Group
URT	United Republic of Tanzania

CHAPTER ONE

INTRODUCTION

The aim of this study was to analyze the capacity development needs of vegetable farmers in Mali village that will improve crop productivity. This section consists of the background of the study, problem statement and objectives of the study, research questions, and significance of the study, limitation and organization of the study.

1.1 Background to the Problem

The idea of capacity development is a key element for achieving development objectives (James & Menachery, 2019). Capacity development is the process through which individuals, organizations, and societies obtain, strengthen, and maintain their capabilities to set and achieve their own development objectives over time in agriculture production (Bester, 2016). FAO (2012) recognizes that capacity development focuses on what farmers should improve to increase their crop productivity. Crop productivity refers to output per unit of all input used in crop production (Aslam, 2016). The level of crop productivity in sub-Saharan Africa remains far below, and this is the case for Tanzania (Jha *et al*., 2020). Many technological improvements have been promoted to increase farmers crop productivity in Tanzania but still the average productivity growth is low (Steffens, *et al*., 2020).

Human capital has a crucial role to play in increasing crop productivity by learning, applying, and disseminating knowledge (Liu *et al*., 2020). It influences a farmer's capabilities to adopt new production technologies that will improve their productivity (Lavlu, 2012). Human capital is the stock of knowledge, skills, and

abilities embodied in individuals that determine the level of productivity, and this includes essential abilities and skills gained through education, training, and experience (Djomo & Sikod, 2012). Therefore, training increases the knowledge of farmers, thereby creating human capital. This is because the knowledge gained will help farmers adopt new technologies and make efficient use of all inputs for crop production (Garrison-Simon *et al*., 2018).

Diffusion of Innovation Theory (DoI), as explained by Rogers (2003), is seen as the driving force behind small-scale farmers' decisions about whether to adopt or reject a certain technology or innovation (Steffens *et al*., 2020). According to DoI theory, a few farmers are initially willing to try new technology or innovation. These few farmers will spread the word more until people become aware of the innovation over time. The adoption of innovation is influenced by social interaction and the perceived need for change (Steffens *et al*., 2020).

In Tanzania, the agriculture sector is a key to economic development Majule's study (as cited in Liberio, 2012) According to the Embassy of the Kingdom of the Netherlands (2017), the vegetable and fruit industry in Tanzania is the fastest-growing subsector, with an annual average growth rate of about 9 to 12 percent per year. Small-scale farmers with less than 2 hectares mainly dominate the horticultural industry (Liberio, 2012).

Despite the fact that vegetable production is a viable option to increase farm income and hence alleviate widespread poverty in Tanzania, a considerable attention to increase production has not given (Mwatawala *et al*., 2019). Cropping is the major

livelihood activity in Mover district, and the available information confirms that over 52% of farmers earn their cash income from vegetable farming (URT, 2013). Therefore, from the above studies, it is obvious that when farmers' needs clearly identified and implemented, it will help them overcome the current situation they are facing.

Cultivation and sales of vegetable crops are the main sources of income in Mlali ward (Tanzania Livelihood Baseline Profile, 2016). The vegetable crops grown throughout the year both through rain-fed and irrigated farms to meet farmers' needs, as this area has access to sources of water like river streams and mountain springs (Tanzania Livelihood Baseline Profile, 2016).

Despite agriculture being the leading sector in the economy of Mvomero District, its performance has been declining following the use of poor agricultural tools, poor knowledge of production techniques, pest control, low purchasing power, and poor access to markets (Mvomero District Council, 2017). Vegetable farmers normally under produce and still suffer where to sell their crops (Mutayoba & Ngaruka, 2018). From the above problem outlined, the question arises: what capacity (new knowledge and skills) do vegetable farmers in Mlali village that is acceptable need and they can continue to grow instead of stagnating at the level they are.

1.2 Statement of the Problem

Vegetable farmers produces is low in quality and quantity as they continue to use traditional methods in crop production (Sudha and Veena, 2019). The average tomato productivity is low, ranging from 2.2 to 16 tons/ha, while on large farms, production ranges from 40 to tons/ha, and this is the case for all vegetable crops

produced in Morogoro (Msogoya & Mamiro, 2016; URT, 2017). Low productivity of vegetable crops has largely contributed by a lack of knowledge and skills among small-scale farmers (Mwinuka *et al*., 2017). It is important that new techniques and technology being accepted and used by farmers (Rahman *et al*., 2018). Farmers need to increase crop productivity on the same land with the use of optimal agricultural technologies (Mutysira *et al*., 2018).

Despite the availability of many innovations and technological advancements in recent years, vegetable farmers still lack produce (Mutysira *et al*., 2018). Adoption of agricultural technologies is still very low among vegetable farmers due to the failure of initiatives aimed at promoting such technologies for crop production (Ochieng *et al*., 2021). Studies like Ochieng *et al*. (2017) show that many initiatives on new agricultural technology for improving crop production are not sustainable. Rahman *et al*. (2018) show that when farmers capacities are developed to meet their needs in terms of knowledge and skills in vegetable production, it results in improved crop productivity.

Studies such as Rogers (2003) have qualitatively estimated the factors influencing the adoption and diffusion of agriculture technology and innovations. There is a lack of research predicting the adoption and diffusion of new technologies and innovations in the vegetable sub-sector of Tanzanian agriculture (Mwinuka *et al*., 2017). In 2012, Djomo & Sikod suggested that, to improve crop productivity, there is a need to invest in human capital through training to enable farmers to gain new knowledge and skills on vegetable crop production. Additionally, there is a lack of research on the capacity development needs of vegetable farmers in terms of gaining

new knowledge and skills in vegetable crop production (Ochieng *et al*., 2021). To the researcher's knowledge, there is a limited empirical study done on identifying the capacity development needs of vegetable farmers to improve their crop productivity. This study seeks to fill the existing research gap by conducting a study to examine the capacity development needs of vegetable farmers in the study area.

1.3 Objective of the Study

1.3.1 General Objective

This study intended to examine the capacity development needs of vegetable farmers in Mlali village toward crop productivity improvement.

1.3.2 Specific Objectives

i. Identify the needed trainings from vegetable farmers to improve crop productivity
ii. Determine the contribution of human capital investment through training of vegetable farmers toward crop productivity improvement
iii. Examine the contribution of diffusion of innovation toward crop productivity improvement.

1.4 Research Questions

i. What are the needed trainings for vegetable farmers to improve crop productivity?
ii. What is the contribution of human capital investment through the training of farmers towards crop productivity improvement?
iii. What is the contribution of diffusion of innovation toward crop productivity

improvement?

1.5 Significance of the Study

This study creates a foundation to understand the capacity development needs of vegetable farmers not only in Mlali village but even globally. The study provides a useful insight on what capacities needed and how should be communicated and adopted by vegetable farmers in Mali village. In particular, the study will provide an opportunity to understand the training needs of vegetable farmers and how could contribute to crop productivity improvement.

Furthermore, the study provides an insight into how human capital investment through training and the diffusion of innovation contribute to improved crop production. The findings of this study have the potential to help researchers widen their understanding of capacity development needs. This research provides literature for researchers who may carry out similar studies. This study will help policymakers, development partners come up with strategies for ensuring the most effective, and appropriate decisions required to enhance crop productivity.

1.6 Limitation of the Study

The data of the study collected from a questionnaire. The study limitations during data collection were included as financial resource constraints to reach all respondents; time constraint given the study is specific designed to meet academic timelines and transport constraints to reach out to all respondents in the study area. The overall implication of the limitation is that data collected within the context of the study objectives.

1.7 Organization of the Study

This study is organized into five chapters namely; Chapter one with detailed background of the research problem so as to justify this study, statement of the problem, research objectives, research questions, significance of the study, and limitation of the study. Chapter two covers definitions of terms, theoretical literature review, empirical literature review, research gap and conceptual framework of the study. Chapter three covers research philosophy, research design, study area, study population; sampling techniques sample size, methods for data collections, data processing and analysis. Chapter four covers data presentation, analysis and discussion of the findings. Finally, chapter five presents summary of the findings and their implications, conclusion, recommendation and suggested areas for further studies.

1.8 Summary

The purpose of this chapter was to introduce the problem. It started with the background of the problem so that to understand the roots of the problem. In addition, the objective and significance of the study identified. The organization of the whole research presented in this chapter.

CHAPTER TWO

LITERATURE REVIEW

2.1 Overview

This chapter reviewed the definition of key terms used in this study, the theoretical literature review, empirical literature review, conceptual framework and the research gap.

2.2 Definition of Terms

2.2.1 Capacity Development

Baser and Morgan's study as cited in McEvoy, *et al.*, (2016) understand capacity development both as a process, an objective and an approach. In its broadest sense, capacity development defined as the achievement of a goal over time (Bester, 2016; McEvoy, *et al.,* 2016). Capacity development is an iterative process of change, which includes the cultural values, altitudes and beliefs (Real & John, 2015). Furthermore, capacity development is understood as the process by which individuals, organization and society as a whole strengthen, create, adapt and maintain their capacity over time for achieving a certain development goals (adapted from CADRI, 2011,p. 9; OECD, 2011; UNDG 2017, p.2).

The definition chosen as it includes important elements of capacity development such that capacity resides at various levels, capacity development is a process, and capacity develops over time (UNDG 2017, p. 2). From this study, capacity development is defined as initiatives that include training programmes, knowledge sharing, technical assistance, and access to technologies designed to empower farmers and other stakeholders with the necessary skills and knowledge to adopt

modern farming techniques, implement sustainable farming practices, and make informed decisions regarding crop production. By investing in capacity development, human capital strengthened to enabling farmers to maximize their potential and contribute to improved crop productivity.

2.2.2 Crop Productivity

Crop productivity is the quantitative measure of crop yield in a given measured area of a field (Lavlu, 2012). The use of new crop varieties, efficient application of agrochemicals and other technologies and techniques contributes to an increase in crop productivity (Qaim, 2020). Crop productivity expressed in kg/ha or crates per acre (FAO, 2012). In another word, productivity measures describe the relationship between the inputs used to produce the commodity or good or services (Doss, 2018). Productivity understood as a measure of how efficiently production inputs such as human capital investments used to improve crop productivity (Fuglie, 2018). The efficiency and effectiveness use of modern technologies and techniques in crop production has a massive increase in crop productivity (Qaim, 2020). In this study, crop productivity defined as the measure of the quantity and quality of crops produced per unit of land from efficiency and effective use of new technologies and techniques gained through farmers' trainings.

2.3 Theoretical Literature Review

There several theories developed to explain the concept of capacity development like Human capital theory and Diffusion of Innovation theory. The theories used to show how capacity development of vegetable farmers contributes to improved crop productivity. This study guided by theories mentioned above.

2.3.1 Human Capital Theory (HCT)

Human capita theory used to explain the concept of human capital investment in this study. Beckers' study as cited by Maran *et al*., (2009) showed that human capital is rooted from the field of macro-economic development theory. Human capital is a force so-called collective knowledge and skills, which is vital for long-term results in agriculture (Hena *et at*., 2018). The main principle of HCT is that education and training are the most important investment in human capital (Becker, 2009). Through training, individuals both learn new knowledge and skills and improve old ones. Therefore, HCT underpins that people invest in their capacities through accumulation of different types of human capital like productive knowledge and skills with the potential of increasing their productivity capacity (Bagdadli, *et al*., 2021).

Mohapatra & Sen (2013) confirmed that; there is an improvement in crop productivity through trained individuals. Level of education of farmers classified as a human capital by some researchers (Mwangi & Kariuki, 2015). Human capital of farmers assumed to have a significance influence in the decision of farmers to adopt new technologies (Lavison *et al*., 2013). Becker identifies human capital from firm specific human capitals and general-purpose human capital (Bagdadli *et al*., 2021). The general-purpose human capitals involve knowledge and skills gained through education and training in areas of value. Regardless of the application, Becker considers education and training to be the most important investment in human capital (Becker, 2009; Maran *et al.*, 2009; Bagdadli, *et al*., 2021).

Strength of HCT: Human capital theory helps researchers and policy makers

evaluate the relationship between human capital investment through training and their expected output or productivity (Hena, *et al.,* 2018). Human capital assumed to have a significance influence on farmers' decision to adopt new knowledge and skills and help them to obtain, process and use information relevant to adoption of new technology and skills (Garrigos-simon, *et al*., 2018).

Limitation of HCT: Human capital theory assumes that, human capital investment increases productivity but provides a little insight into the process through which human capital investment through training translated into high performance (Marginson, 2019). The investment required to achieve a desired outcome in one area differs to the other area because of the unique characteristics of each area (OECD 2014a, 102-170). Therefore, the researcher used this theory as it has a positive and significance influence on farmers' decision to adapt to the use of new technology. Human capital in agriculture delivered through various ways like training in famer's field, classroom, one on one at the farm or extension office and many other model of knowledge delivery to farmers (Davis *et al*., 2021). These human capital delivery models represent ways of improving their capacity in crop production.

2.3.2 Diffusion of Innovation Theory

Diffusion of innovation theory (DoI) first proposed by Roger (1962) with later editions (Rogers, 1999, 2003). Diffusion of Innovation concept has used in the past to explain the acceptance behavior of farmers (Echchabi *et al*., 2015). Diffusion of Innovation (DoI) theory places an emphasis on innovation as an agent of behavior change (Roger, 2003). Diffusion is a process that sees innovation communicated

through certain channels over time among the members of social systems (Rogers, 2003). DoI theory argues that, behavior will change more rapidly if innovations are perceived as being better than the existing options or capacity (relative advantage) and consistent with the existing values, experiences and needs of potential adopters (compatibility; if they are easy to understand (Complexity), testable and their results are visible (Pascaris, *et al*., 2020). This theory is useful especially in creating awareness among potential adopters and later be more effective in persuading actual adoption (Dan, *et al*., 2019).

Strength of DoI: This theory tells why the technology or new capacity can be accepted or rejected based on relative advantages between the old and new capacities, compatibility, complexity, testability and observability for capacity improvement (Dan, *et al*., 2019). Limitation of DoI: According to Rogers, 2003, DoI assumes all innovations are positive and adopted which is a pro-innovation bias. One-way model is difficult and multiple communication flow has is considered. It does not take into account an individual resources or social support to adopt the new capacity.

In the context of the diffusion of innovation theory as applied in capacity development, several variables play a role in understanding the process of how new agricultural practices or technologies are adopted and spread among farmers (Dan, *et al*., 2019). The adoption and diffusion of new agricultural technologies and innovations depends on factors like communication channels and perceived attributes of innovation (Ali, *et al*., 2019). Therefore, the relationship between DoI variables for promoting crop productivity improvement depends on the interplay of

communication channels and perceived attributes of innovations aimed at promoting the widespread adoption and successful implementation of new gained knowledge and skills (Pambe, 2022). Ali, *et al*., (2019) concluded that DoI theory had been a choice of many researchers particularly in studies that focus on adoption of innovations.

2.4 Empirical Literature Review

Little has written in academic literature on capacity development in the previous decades, from 1990s we saw an increase in references to capacity development (Real & John, 2015; United Nations, 2015). Since then the economist have extensively studied the role of human capital in improving person productivity (Becker, 2009; Davis, *et al*., 2021). Empirical evidence suggest that investment in human capital, agricultural research and training have demonstrated the highest returns in terms of agricultural productivity (FAO, 2012). Despite these findings, there is limited knowledge on effective measurement of human capital in improving agriculture productivity. These studies recognized the need for understanding of human capital investment in enhancing capacity development of farmers.

The individual capacity development focused on Knowledge and skills gained through training that need transformation in favor of farmers to improve their productivity (Bester, 2016). Human capital understood as the stock of knowledge, skills and capacity of individuals that determine the level of productivity (Garrigos-simon, *et al*., 2018). The study done by Kraay (2019) pointed out that in order to improve capacities of farmers there is a need to invest largely in human capital to be able to gain substantial long-term economic returns, such as improved crop

productivity and reduce poverty in the society. Despite the benefits that come from human capital investment on farmers to improve their capacities it is difficult to full capture all the outcome and impacts contributed by human capital to generate improved crop productivity and livelihoods. This study outlined that many interventions on developing farmers' capacities should put a substantial consideration on human capital investment for improving productivity.

Investing in the human capital of farmers may be referred to as providing trainings, extension services, technical advice, technology transfer, capacity strengthening, technology transfer, agricultural entrepreneurship, knowledge and skills exchange, to name a few (Davis *et al*., 2021). Human capital often invested in as a means to an end rather than an end in itself (Qaim, 2020). The study done by Davis *et at*., (2021) gives some limitations inherent to the concept of human capital investment for capacity development. The objective to increase crop productivity and income of farmers and gaining knowledge and skills through training is one way to achieve capacity development objectives. Human capital is one of the several component used to improve capacities of farmers. Therefore, there is a need to identify farmers' capacity development need for improving their crop productivity.

Human capital theory captures the essence of this study by seeking to determine the training needs of vegetable farmers in order to develop their capacities. The study done by Sajeev & Singha (2021) found out that training provides a systematic way of improving knowledge and skill, which in return help farmers, improve productivity. Their study suggested that Farmers training aimed at improving their farming practices. Human knowledge and skill gained through training directly

increase productivity and enhances ability of farmers to adopt new technologies.

Training intervention for farmers is any form of program that is targeting to facilitate the transfer of knowledge and skills on topics or areas that are of great need and benefit to farmers. Findings from this study find out that training interventions for farmers differ in many ways. The study outlined two types of training interventions that focused on teaching farmers' new knowledge and skills using top-down training and bottom-up training approach. Although traditionally top-down approach to train famers have overtime become more in use, bottom-up approach like farmers field school, on-farm demonstration and individual farm visit have become more in use as they are perceived participatory, empowering and practical in nature focusing on solving problems and priorities identified by farmers themselves, rather than on issues and challenges determined by outsiders. Thus, there is a need to analyze the training need of the farmers and decide the need based strategies to be followed for the benefit of the farming community.

The study done by Danquash & Amankwah-Amoah (2017) to examine the contribution of human capital to productivity growth in selected 45 Sub-Sahara African countries from 1960 to 2010 noted that human capital contributed to productivity improvement of farmers via certain communication channel of innovation. By employing data from 45 SSA countries, the study deepens the understanding of the relationship between human capital and diffusion of innovations among farmers. This study therefore has uncovered human capital as the engine of productivity and growth of farmers through innovation and adoption of new technology and techniques. On the other hand, their study found that human

capital had a positive and statistically significant impact on diffusion and adoption of technology however, its effect on innovation found to be insignificant.

Although the study confirms that human capital and diffusion of innovation are important and affects productivity and growth of farmers, the fundamental questions remains on how concretely it affects the flow of knowledge gained through training in a farming community. Furthermore, the study adds evidence to growing stream of research that have been investigating on the quality of human capital as the most important factor in explaining the effects human capital. However it is not the mere possession of human capital that delivers these benefits rather the ability to deploy and use them that create conditions for innovation and new capacity development in farming communities.

Peter, *et al*., (2021) have conducted a research on the accessibility to proper information on new agricultural techniques and technology in agricultural development for enhancing farming productivity. Their study revealed that farmers access agricultural information from different communication channel. They found that agriculture information and technological communications strongly needed for improving productivity. Smoothly flow of information and utilization of available agriculture knowledge and skills helps in adoption of new agricultural technology. The report of this study shows that farmers with better access to extension and technological services add relatively high performance in terms of productivity than their counterparts. This shows a need to improve on access to information and communication channel in farming communities, which would subsequently

improve adoption on new technology in agricultural sector. Moreover, the study revealed that information utilization by farmers depends on the perceived attributes of innovation, trust and reliability of the information.

According to this study, much extension information are outdated, unreliable and rely on conversional methods of information delivery and training while application of modern and innovative technology is very limited. This has caused most of these technologies rejected by farmers. Therefore, we should put a focus on the availability and use of agricultural information and technologies that is acceptable by farmers themselves and perceived better than the existing options, compatible, easy to use and results are visible and can be tested in their local area.

Many global studies show that smallholder farmers could make a major contribution to the national economic growth if they receive new knowledge and skills through trainings to become more productive (Rahman, *et al*., 2018; Steffens, *et al*., 2020; Kulyakwave, *et al*., 2023). Study conducted by Rahman, *et al.*, (2018) in Bangladesh to attempt to determine the needs of famers showed that, different farmers has different interest in training needs from different locations. This shows that there is a great need to know the training needs of farmers before implementation of any programme for the benefit and acceptance of farmers themselves.

The study conducted by Steffens, *et al.*, (2020) indicated that, agricultural productivity in sub-Sahara Africa remains far below global average. This is partly due to the scarce use of new technologies and skills in crop production. In addition, their study on adoption of agricultural technologies reported that, farmers do not adapt to improved production technology, as they are unaware of the technology on

the side of cost and benefit, not compatible and even not available and easily accessed by farmers. The finding indicated the gap between availability of agricultural technologies and their adoption.

The study done in Tanzania by Kulyakwave, *et al*., (2023) confirms that majority of the farmers use Old fashioned farming equipment and application methods as well as poor infrastructure, thus creating a wide gap in terms of information dissemination. Lack of timely agricultural information and technological communication created challenges of adoption to small-scale farmers in Tanzania. In addition, the study pointed out that available local extension officers are very few and lack up to date information, which deprive farmers to get the desired agricultural information to enhance their farming practices. Therefore, the finding indicated that lack of updated information about the availability of new technologies that is accepted by farmers impede farmers to attain their fully production potential.

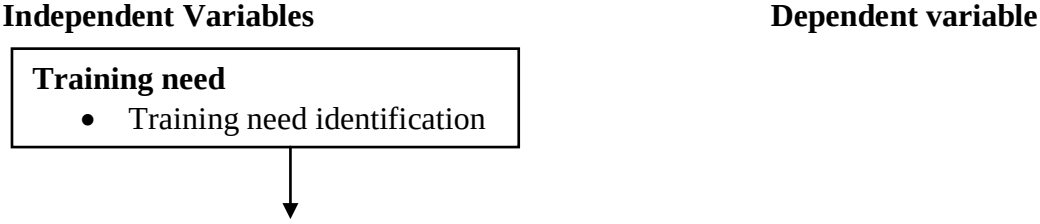
The study also found out that small scale farmers are at the risk of constant low productivity due to many factor like small plot size, low use of improved agricultural inputs, unfavorable soil and climate conditions. This supported by FAO, (2013) which indicated that African agriculture sector underperforms when compared to global production following low use of improved agricultural technologies and unfavorable climate in the continent. To bridge this gap the study recommended improving on the diffusion and adoption of agricultural technologies in Tanzania and Africa as whole.

2.5 Research Gap

From the results of the reviewed literatures, the study observed that a potential research gap in the field of human capital and diffusion on innovation for smallholder farmers could be limited by the understanding of the specific factors that influence the adoption and sustainable implementation of the innovative farming practices. These studies have explored the importance of human capital in enhancing farmers' knowledge and skills. There is a need for further investigation into the contextual factors that facilitate or hinder the diffusion of innovation among farmers. To specifically exploring the role of human capital and diffusion of innovation by identifying the training needs, communication channels and attributes of innovation on farmers' decision-making process. This could provide a valuable insight into designing sustainable strategies for promoting innovation adoption and capacity development of smallholder farming communities.

2.6 Conceptual Framework

The conceptual framework illustrates the relationship between independent and dependent variables (Bryman and bell, 2007). This conceptual framework consists of independent variable namely Training need, human capital investment and diffusion of innovations. These variables identified as key factors that influence crop productivity improvement which serve as the dependent variable. This conceptual framework emphasizes the significance of training needs, human capital investment and diffusion of innovation in driving crop productivity improvement by elucidating the relationship between these variables.



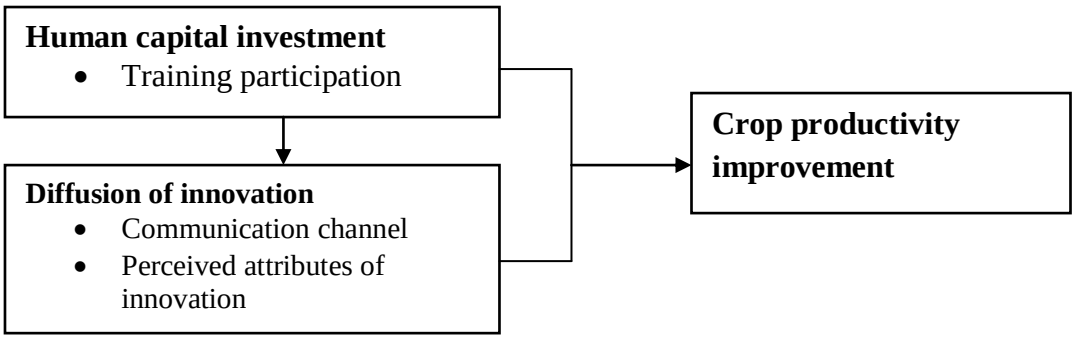


Figure 2.1: Conceptual Framework
Source: Researcher's own construct (2022).

2.7 Summary

This chapter provided the literature that informs the formation of the study variables. It reviewed the theoretical framework where human capital theory and Diffusion of Innovation theory explained. The relationships between variables have shown in the conceptual framework. In addition, empirical literature reviews of the study and research gap presented in this chapter.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Overview

This chapter focused on the methodological approach. It is organized into the following sections: research philosophy, research design, the study area, Target population, sampling techniques and sample size, data collection methods, data analysis, interpretation and presentation and lastly the validity, reliability and ethical consideration.

3.2 Research Philosophy

Research philosophy defined as a system of beliefs and assumptions about the development of knowledge (Saunders *et al*., 2019). Therefore, the research philosophy that guided this study was Positivism. Positivism used in this study by employing rigorous quantitative methods aimed to provide objective insights that allow measuring of the impact of human capital investment on farmers' knowledge, skills and productivity. This allowed collection and analysis data on variables such as training need, human capital investment and diffusion of innovation that used to inform based-evidence for promoting crop productivity improvement.

3.3 Research Design

Kothari (2020) defines research design as the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure. This study guided by cross sectional research design. The design allowed collection of data from different groups of respondents at one point in a time. By collecting data simultaneously, the researcher

was able to gain insight into the current state of variables training needs, human capital investment and diffusion of innovations aimed at promoting crop productivity. The cross section design is more time and cost effective. The data collected used to describe and explain the relationships between variables. The choice of this design facilitated the efficiency collection and analysis of data used to achieve the research objective.

3.4 The Study Area

This study conducted at Mlali Village located in Mvomero district region of Morogoro. The district is boarded by handeni district, Tanga region in the North, Bagamoyo District in the east, Kilosa District in the West, Morogoro rural and Morogoro Urban in the South. Mlali village is on the low land adjacent to the Uluguru Mountains. The climate in the area is semi-arid with annual rainfall ranging from 500 – 800 mm. Mlali village of Mvomero district is known for it is agricultural activities particularly cultivation of vegetable crops. This makes it suitable location to investigate the contribution of human capital investment and diffusion of innovation in the context of smallholder farmers.

3.5 Target Population

Target population defined as the largest group from which the representative sample taken on behalf of large group (Kothari, 2020). Mlali village has four hamlets, which are Peapea, Vitonga, Majengo and Gudugudu. All smallholder vegetable farmers in Mlali village constituted the study population. The target population of the study comprised 170 vegetable farmers from Mlali Village. The selection of this target population based on the research objectives, which aimed to investigate and

understand various aspects related to vegetable farming, such as human capital investment through training of new production techniques and diffusion of innovations. By focusing on this target population, the study was able to provide valuable insights and recommendations that can contribute to improvement of crop productivity.

3.6 Sampling Techniques and Sample Size

3.6.1 Sampling Size

A sample size refers to the number of items selected from the population to constitute a sample (Kothari, 2020). A simple random sampling used to obtain a sample size of 119 vegetable farmers from Mlali village to represent the total population at confidence level of 95% and level of precision of 5% as derived from Yamane (1967) formula. This helped to minimize biasness and ensured that the sample accurately represented the large population of vegetable farmers in the village. The Yamane formula delivered as below:

$$n = \frac{N}{1 + N\,(e)^2} \quad \text{..... ……..} \quad \text{(Equation 1)}$$

Where: n is the sample size,

N is the population size = 170,

e is the level of precision (Sampling error) = 5% or 0.05

$$n = \frac{170}{1 + 170\,(0.05)^2}$$

$$n = 119$$

3.6.2 Sampling Techniques

Random sampling ensures the law of statistical regularity, which states that ‘if on an

average the sample chosen is a random one; the sample will have the same composition and characteristics as the population (Kothari, 2020). This study used simple random sampling to ensure representativeness, minimize biasness, and enable statistical inferences that established the causal relationships and generalization of the study findings from the large population. Therefore, this study used simple random sampling techniques.

3.7 Reliability

Reliability is the extent to which results are consistent over time and accurate representation of a total population (Acharya, 2010) in other word refers to the stability of the measuring instrument used and its consistent over time (Sürücü & Maslakci, 2020). The instrument pre-tested for reliability using Cronbach's alpha (α). Cronbach's alpha measures the degree of internal consistence (Hajjar, 2018). In this study, the reliability index obtained for all independent variables was .736. According to Sürücü & Maslakci (2020) Cronbach's alpha value of 0.7 and above is an indicator of the internal consistency of the scale.

3.8 Validity

Validity refers to the measure of how well the measuring instrument performs its functions and the extent to which results accurately interpreted and generalized to the study population (Sürücü & Maslakci, 2020). They are useful aspects to assessment that link the concepts to empirical determinants (Kothari, 2020). For the validity of this study, a questionnaire read by the supervisor and academic members of the Open University of Tanzania in which their comments as experts were used to

modify the questionnaire before pre-testing in order to suit the objectives of the study.

3.9 Data Collection Methods

Data collection method refers to the systematic process of gathering data from various sources in order to address the specific research objective (Kothari, 2020). It involves selection of appropriate techniques to collect relevant and reliable data. For the purpose of this study, a questionnaire used to collect data from the study area. This technique ensured reliability and validity of the collected data in this study.

3.9.1 Questionnaire

A questionnaire is a document containing questions and other prompts for gathering information from respondents (Acharya, 2010). This study used a structured questionnaire to gather information from the sampled target groups. A questionnaire was used as it was considered appropriate for the study since it was relatively considered to save time, easy to arrange, standardized in answers provided to the extent that all respondent are exposed to the exactly the same set of questions and pre-coded in answers for easy management at analysis (Krosnick, 2018).

3.10 Data analysis, Interpretation and Presentation

Data analysis involves the systematic application of statistical tools (Bergin, 2018). The collected data interpreted to reflect the research questions and objectives. After analyzing the data, the researcher used tables and descriptions to present the findings. The Statistical Packages for Social Science (SPSS) version 25 used to process the data collected. Both descriptive and regression analysis was used to analyze data collected. The simple linear regression model used to analyze the

contribution of each variable to crop productivity improvement. The simple linear regression model used given as: $\boldsymbol{y = \beta 0 + \beta 1 \times + \varepsilon}$

Where: **y** represents crop productivity improvement and × represent each of the independent variables namely; Human capital investment and diffusion of innovations. The term ε is the residual or error. $\boldsymbol{\beta 0}$ and $\boldsymbol{\beta 1}$; are constants to be determined.

3.11 Ethical Consideration

Ethical consideration considered as one of the important parts of the research (Bryman and Bell, 2007). The need to safeguard confidentiality of the respondents in this study considered. In order to address ethical consideration, voluntary participation of respondents was important and participants have right to withdraw from the study at any stage if they wished to do so. The study avoided any user of offensive, discriminatory or other unacceptable languages in the formation of questionnaires.

3.12 Summary

The purpose of this chapter was to provide detailed information on how the study conducted in the field. It provided the plan on how the research carried out. It dealt with the methodology of this study, which have employed in collection of data. The instrument, which used to collect data, was a questionnaire. The chapter also explained how the data analyzed, interpreted and presented.

CHAPTER FOUR

DATA ANALYSIS, PRESENTENTATION AND DISCUSSION

4.1 Overview

This chapter presents data that collected from the field, its analysis, presentation, interpretation and discussion. In addition, this chapter presents the characteristics of the respondents, Farming and land allocation patterns and capacity development needs toward crop productivity improvements. The data presented in the form of Tables.

4.2 Characteristics of the Respondents

Characteristics of the respondents sought in particular gender, age, level of education, marital status, primary occupation and source of income in order to help the researcher have the background information of the respondents.

Table 4.1: Characteristics of the Respondents (n=119)

Gender	Frequency	Percent
Male	95	79.8
Female	24	20.2
Age Categories (Years)		
<20	1	0.8
20 – 29	32	26.9
30 – 39	26	21.8
40 – 49	27	22.7
> 49	33	27.7
Marital status		
Single	24	20.2
Married	85	71.4
Separated/divorced	6	5.0
Widow/widower	4	3.4
Level of education		
Never gone to school	19	16.0
Primary education	70	58.8
Secondary education (Form IV)	5	4.2
Secondary education (Form VI)	17	14.3
Certificate	2	1.7
Diploma	4	3.4

Adult education	2	1.7
Primary occupation	**Frequency**	**Percent**
None	1	0.8
Farmer	115	96.6
Agricultural Laborer	2	1.7
Shop owner	1	0.8
Source of income		
Sales of Maize	51	42.9
Sales of Vegetable crops	114	95.8
Sales of Livestock products	8	6.7
Sales of chickens	14	11.8

Source: Field data (2022)

4.2.1 Gender of the Respondents

In this section, the study sought to establish gender of the respondents to recognize both the role of male and female participation in farming activities. Findings in Table 4.1 show that 95 (79.8%) farmers were male and the remaining 24 (20.2%) were female. This shows that males dominated the participation in farming activities. Based on this findings; it implies that more male are involved in farming activities in the study area than female. This comply with the findings of Farnworth, *et al*., (2018) who argued that Women's participation in agricultural productivity remains very lower than that of men in sub-Sahara Africa (SSA).

4.2.2 Age of the Respondents

In this study, age of the respondents sought important as a matter of maturity in understanding items in the questionnaire. Table 4.1 shows that 1 (0.8%) of respondent was below 20 years of age, 32 (26.9%) were between 20 – 29 years of age, 26 (21.8%) between 30 – 39 years of age, 27 (22.7%) between 40 – 49 years of age and 33 (27.7%) were above 49 years of age. This shows that large proportions of the respondents were in the age of mental maturity to handle tasks related to vegetable farming activities. The implication of this finding is that; matured farmers

middle-aged farmers are more responsible and more active in performing agricultural practices. Upadhyay, *et al*., (2020) and Rajashekar, *et al*., (2021) who argued that farmers in the middle age are more responsible and active in performing agricultural practices supported this finding. They therefore had adequate understanding of their needs in farming practices.

4.2.3 Marital Status of the Respondent

This study sought on data for marital status of the respondent as it defines their level of responsibility. Table 4.1 shows that 24 (20.2%) were single, 85 (71.4%) were married, 6 (5.0%) were separated/divorced and 4 (3.4%) were widow/widower. Therefore these results indicate that majority of farmers 85 (71.4%) were married. Based on the findings; it implies that majority of farmers in the study area were married and more responsible to handle family affairs and farming practices.

4.2.4 Level of Education of the Respondents

The data sought on the highest education level of the respondents. This was important as education improves the quality of work of farmers in the study area. Results in Table 4.1 show that 19 (16.0%) of the respondent had never gone to school, 70 (58.8%) had primary education, 5 (4.2%) had secondary education (form IV), 17 (14.3%) had advanced secondary education, 2 (1.7%) had certificate, 4 (3.4%) had diploma and 2 (1.7%) had adult education. These findings suggest that many farmers 70 (58.8%) had primary education and 19 (16.0%) were illiteracy.

The findings imply that most respondents had primary education level and above which provided the reason o train and develop them. Furthermore, the implication is

that they were able to understand the questionnaire. The results are in agreement with Lazaro & Alexis (2021) which reported that most smallholder farmers had primary education and which influences their decision to adopt new technology and innovations, which led to the improvement of crop productivity.

4.2.5 Primary Occupation of the Respondents

This study sought on the primary occupation of the respondents. This is to enable the research to assess the level of participation in smallholder farming. The finding in Table 4.1 shows that, the primary occupation of majority of vegetable farmers in Mlali was farming 115 (96.6%). Agricultural laborer were 2 (1.7%), shop owner was 1 (0.8%) and without primary occupation 1 (0.8%). This result implies that large proportional of vegetable farmers depend on farming to generate their income.

4.2.6 Source of Income of the Respondents

The data sought on source of income of the respondents. Table 4.1 shows that most 114 (95.8%) of the respondents relied on sales of vegetable crops as their major source of income, 51 (42.9%) relied on sales of maize, 14 (11.8%) relied on sales of chicken while only 8 (6.7%) depended on sales of livestock products. This implied that; the major source of income of farmers in the study area relied mostly on sales of vegetable crops.

4.3 Farming and Land Pattern Allocation

In this section, data on land access, mode of land ownership, land size, size of the land cultivated with vegetable crops, types of crops cultivated, year of experience in vegetable farming and reasons for growing vegetable crops was sought. This was important as it linked to low agricultural productivity among smallholder farmers.

Table 4.2: Farming and Land Pattern Allocation (n=119)

Access to land	Frequency	Percent
No	0	0
Yes	119	100
Mode of land ownership		
Purchased	39	32.8
Rented	55	46.2
Inherited	25	21.0
Size of the land owned in (Acres)		
1-4	95	79.8
5-9	14	11.8
10-14	2	1.7
15-19	7	5.9
20- 24	1	0.8
Land cultivated with vegetables (Acres)		
1-2	109	91.6
3-4	6	5.0
5-6	2	1.7
7-8	2	1.7
Types of crop cultivated		
Tomatoes	110	92.4
Watermelon	4	3.4
Onion	10	8.4
Carrot	1	0.8
Cabbage	11	9.2
Sweet pepper	18	15.1
African eggplant	1	0.8
Others	6	5.0
Farming experience (years)		
33-42	7	5.9
23-32	17	14.3
13-22	28	23.5
03-12	44	37.0
Below 02	23	19.3
Reasons for growing vegetable crops		
Source of food	33	27.7
Source of Income	91	76.5
Main staple food	1	0.8
Source of both food and Income	29	24.4

Source: Research data (2022).

4.3.1 Land Access and Mode Ownership

The data sought on land access and mode of ownership so as know who have access to land and type of ownership of the land involved in farming activities. Result in Table 4.2 shows that all 119 (100%) vegetable farmers participated in this

questionnaire had access to land. In addition, the result showed that 55 (46.2%) of the respondents rented the land, 39 (32.8%) purchased the land and 25 (21.0%) inherited that land. These findings show that all famers participated in this study had access to land though most of farmers 55 (46.2%) rented the land for vegetable farming.

The findings imply that most vegetable farmers had limited land ownership, which might result in low crop productivity among smallholder farmers in the study area. This concurred with the study of Selejio & Norman (2022) who noted that lack of land ownership as one of the factor contributing to decline in the productive capacity of smallholder farmers following unsustainable investment of a rented land.

4.3.2 Size of the Land

The data sought important as it may have an influence on farmers' decisions to adopt new technology and innovations. Result in Table 4.2 shows that large number of respondents 95 (79.8%) own the land between 1-4 acres, 14 (11.8%) own the land between 5-9 acres, 2 (1.7%) between 10-14 acres, 7 (5.9%) between 15-19 acres and only 1 (0.8%) owns the land between 20-24 acres. This result indicates that majority of the respondents 95 (79.8%) were smallholder farmers with farm size ranging from 1-4 acres.

The findings imply that most of the respondents possessed small piece of land resulting to small investment and hence low crop productivity. The findings agreed with those of Selejio & Norman (2022) who noted that low crop productivity linked to the challenges associated with land ownership for agricultural activities, among

other reasons in Tanzania. Furthermore, Massresh, *et al*., (2021) found that, resource such as land size affects the adoption of new technology and innovations in agriculture.

4.3.3 Size of Land Cultivated with Vegetables Crops

The data sought on the size of land cultivated with vegetable crops. This was necessary to show the level of smallholder farmers' participation in vegetable crop farming in the study area. Findings from Table 4.2 show that 109 (91.6%) of the respondents cultivate 1-2 acres of vegetable crops, 6 (5.0%) cultivate 3-4 acres, 2 (1.7%) cultivate 5-6 acres and 2 (1.7%) cultivate 7-8 acres. This result indicates that majority of farmers 109 (91.6%) cultivated vegetable crops on the land ranging from 1-2 acres. Based on this finding, it implies that vegetable crops mainly produced at small scale in Mlali village.

4.3.4 Type of Crops Cultivated

The data on type of crop cultivated sought. This was necessary to show type of crops mostly cultivated by farmers in Mlali village. The findings in Table 4.2 show that 110 (92.4%) of the respondents cultivated tomatoes, 18 (15.1%) cultivated sweet pepper, 11 (9.2%) cultivated cabbage, 10 (8.4%) cultivated onion, 4 (3.4%) cultivated watermelon, 1 (0.8%) cultivated African eggplant and carrot respectively and 6 (5.0%) cultivated other crops. This result shows that smallholder farmers in Mlali depend more on tomato crop to earn their income. The implication of this finding is that majority of farmers in Mlali village are involved in tomato farming. This is in agreement with Morogoro regional report, which showed that, Mvomero district had the largest planted area with tomato crops in the region (NSCA, 2007).

4.3.5 Years of Experience in Vegetable Farming

The respondents were required to indicate the period of time they started farming vegetable crops. This was necessary to get the overall picture of famers who participated in this study. Findings in Table 4.2 show that 44 (37%) of all respondents had an experience of 3 -12 years in farming activities. Further the table shows 28 (23.5%) were between 13 – 22 years in vegetable farming, 23 (19.3%) had below 2 years of experience in vegetable farming, 17 (14.4%) were between 23 – 32 years of experience and 7 (5.9%) were between 33 – 42 years of experience in vegetable farming. The findings imply that most respondents had a good experience in vegetable farming between 3-12 years and above and that they were able to understand the issues in this study.

4.3.6 Reason for Growing Vegetable Crops

Reason for growing vegetable crop data sought in this study. This was necessary to show why many of the respondents in this study relied on vegetable crop production. Findings in Table 4.2 show that many of the respondents 91 (76.5%) participated in this study grow vegetable crops as their source of income, 33 (27.7%) as source of food, 29 (24.4%) as source of both food and income while only 1 (0.8%) grow vegetable crops as the main staple food. This findings imply that most 91 (76.5%) of the respondent relied on vegetable farming as the main source of household income.

4.4 Training needs and Human Capital Investment

In this section, data sought on training needs and human capital investment toward crop productivity improvement. This was important to show the training needed and the contribution of human capital investment toward crop productivity improvement.

4.4.1 Training Needs of Vegetable Farmers in Mlali Village

In this sub, section data sought on identifying the training needs so that to get the understanding of the real needed trainings by farmers. The major training need area identified in this study were selecting and buying inputs, land preparation, planting methods, fertilizer use, pest and disease control, irrigation, harvesting, storage of vegetable crops and accessing market information. The other training need area included in this study were managing finance, entrepreneur skills, small business development, forming and managing self-help groups.

Table 4.3: Training Needs of Vegetable Farmers (n=119)

Training need area	Importance of the training area							
			Not Important		Important		Very Important	
	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Selecting and buying inputs	31	26.1	x	x	8	6.7	22	18.5
Land preparation	30	25.2	1	.8	9	7.6	21	17.6
Planting methods	48	40.3	1	.8	10	8.4	37	31.1
Fertilizer use	89	74.8	1	.8	24	20.2	63	52.9
Pest and disease control	81	68.1	x	x	18	15.1	62	52.1
Irrigation	47	39.5	1	.8	12	10.1	34	28.6
Harvesting	20	16.8	1	.8	8	6.7	12	10.1
Storage of vegetable crops	22	18.5	2	1.7	3	2.5	17	14.3
Accessing market information	91	76.5	x	x	19	16.0	74	62.2

Source: Research data (2022).

Table 4.4: Current knowledge (Competence) on the Training Area (n=119)

	Current knowledge (Competence)									
	None		Low		Medium		High		Very high	
Training need area	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Selecting and buying inputs	4	3.4	20	16.9	6	5.0	1	.8	x	x
Land preparation	5	4.2	18	15.1	5	4.2	1	.8	1	.8
Planting methods	3	2.5	27	22.7	18	15.1	x	x	2	1.7
Fertilizer use	10	8.4	53	44.5	24	20.2	x	x	1	.8
Pest and disease control	11	9.2	54	45.4	14	11.8	x	x	2	1.7
Irrigation	16	13.4	26	21.8	4	3.4	x	x	1	.8
Harvesting	4	3.4	7	5.9	7	5.9	1	.8	1	.8
Storage of vegetable crops	5	4.2	14	11.8	2	1.7	x	x	1	.8
Access to market information	30	25.2	48	40.3	10	8.4	2	1.7	2	1.7

Source: Research data (2022)

Table 4.3 presents the training needs of vegetable farmers in the study area and the importance of each training area. The findings in Table 4.3 show that accessing market information was the most preferred area of training need by respondents 91 (76.5%) and 74 (62.2%) of the respondent choose the area as very important. While results in Table 4.4 showed that, the level of competence of the respondent on the area of accessing market information was low 48 (40.3%) followed by those with none competence 30 (25.2%), medium competence 10 (8.4%), high competence 2 (1.7%) and very high competence 2 (1.7%). These results imply that, accessing market information was the most preferred area of training needs by 91 (76.5%) respondents.

The findings in Table 4.3 indicated fertilizer use as the second most preferred training area by respondents 89 (74.8%) and 63 (52.9%) of the respondent choose the area as very important. While results in Table 4.4 indicated the level of competence of the respondent on the area of fertilizer use was low 53 (44.5%) followed by those with medium competence 24 (20.2%), none competence 10 (8.4%) and very high competence 1 (.8%). This result indicates that fertilizer use was the second preferred area of training by farmers in the study area.

The findings in Table 4.3 further indicated that, pest and diseases control was the third preferred training area by respondents 81 (68.1%) and 62 (52.1%) of the respondents choose the area as very important. While results in Table 4.4 indicated the level of competence of the respondent on pests and diseases control was low 54 (45.4%) followed by those with medium competence 14 (11.8%), none competence 11 (9.2%) and very high competence 2 (1.7%). This finding implies that pests and

diseases control was the third preferred area of training in the study area.

Furthermore, Table 4.3 indicated planting methods as the fourth preferred area of training needs by respondents 48 (40.3%) and 37 (31.1%) of the respondent choose the area as very important. While the results in Table 4.4 indicated the level of competence of the respondent on planting methods was low 27 (22.7%) followed by medium competence 18 (15.1%), none competence 3 (2.5%) and very high competence 2 (1.7%). This finding implies that planting methods was the fourth preferred area of training need in the study area.

The results in Table 4.3 indicated 47 (39.5%) of the respondents preferred to be trained on irrigation and only 34 (28.6%) choose the area as very important area of training in the study area. While the results in Table 4.4 indicated the level of competence of the respondent on irrigation was low 26 (21.8%) followed by none competence 16 (13.4%), medium competence 4 (3.4%) and very high competence 1 (.8%). Further, the Table 4.3 indicated other area of training were least preferred by vegetable farmers in the study area. It showed that only 31 (26.1%) of the respondent choose selecting and buying of inputs, 30 (25.2%) choose land preparation followed by 22 (18.5%) and 20 (16.8%) storage of vegetable crops and harvesting respectively. The findings imply that irrigation was the fifth preferred area of training need in the study area.

The findings agreed with the study of Yu & Wang (2014) which found that farmers in the Eastern Cape, South Africa viewed access to market information as very important in any agricultural enterprise in influencing the general value of

agricultural produce and the net return for farmers. The findings also agreed with Sajeev & Singha (2021) who noted that identifying the training needs of farmers is very important to reduce the existing technological and adoption gap among farmers and their study revealed that farmers in Arunachal Pradesh in India had their most important training needs on water conservation and irrigation management. This was important to enable them operate irrigation technologies and managing water appropriately for agricultural practices.

The findings also agreed with the study of Tshwene (2019) which revealed that training on appropriate application of herbicide and fungicides along with selecting of planting methods for various crops were the most prominent and important needs of small holder farmers of North west province of South Africa. This followed by training on planning and harvesting practices on various crops, knowledge of crop rotation and calculating the amount of fertilizer application on various crops. This implied that farmers had training need area of their interest that need to be in place for them to accept and implement to improve crop productivity.

Furthermore, the findings are in agreement with the study done by Rahman *et al*., (2018) who reported that integrated pests and disease management, production of bio control agents and bio pesticides, marketing and transportation, production and management technology, production and value addition were the important training need area where majority famers had high level of training need. There is a growing need to identify the training needs of the farmers and decide on the most preferred trainings for the benefit of all farmers in the study area. This is important because knowledge and skills gained through training build confidence and competence of

farmers.

Table 4.5: Other Area of Training Need (n = 119)

Training need area	Frequency	Percent
Managing finance	60	50.4
Entrepreneur skills	87	73.1
Small business development	50	42
Forming and managing self-help groups	57	47.9
No training needed	19	16

Source: Research Data (2022)

The findings in Table 4.5 revealed other training area needed by farmers in the study area. 87 (73.1%) of the respondents in the study area preferred to be trained on entrepreneur skills followed by 60 (50.4%) of respondents who choose managing of finance, 57 (47.9%) forming and managing self-help groups, 50 (42%) small business development and only 19 (16%) of the respondents did not need any additional training. The finding implies that majority of vegetable farmers in the study area needed additional training on entrepreneur skills. This finding concurred with those of Mugabi (2014) who noted that agricultural production and marketing skills along with knowledge of entrepreneur skills and managing of finances forms part of the training need interest for farmers in Uganda. Therefore, this training need area have be given consideration while formulating training courses for farmers in the study area.

4.4.2 Contribution Human Capital Investment on Crop Productivity Improvement

The contribution of Human Capital Investment on vegetable farmers toward crop productivity improvement analyzed, presented and interpreted. Descriptive statistics of valid items, mean, standard deviation for farmers' participation in training and

crop productivity improvement shown in Table 4.6.

Table 4.6: Descriptive Statistics for Training and Crop Productivity Improvement

	N	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Training participation	119	.584	.188	1.798	.222	1.254	.440
Crop productivity improvement	119	.329	.065	1.882	.222	1.568	.440

Source: Research Data (2022).

In table 4.6, the mean and standard deviation for training participation are presented as M = .584 and SD = .188 respectively. It was generally agreement upon that farmers in Mlali village participated in training practices. The table also displays the mean and standard deviation for crop productivity improvement (M = .329; SD = .065). Similarly, there was a general agreement that farmers in Mlali had experienced improvement crop productivity.

Table 4.6 also includes a test for the normality of error distribution for the study variables training participation and crop productivity improvement conducted through skewness and kurtosis. According to Demir (2022), the distribution of variables considered normal if its skewness fall in the range of ±2 and its kurtosis fall in the range of ±7. The findings indicate that both variables training participation and crop productivity improvement exhibited skewness and kurtosis value within the accepted range, satisfying normality.

Results in Table 4.6 suggested that vegetables farmers in Mlali village actively participated in training and experienced an improvement in crop productivity.

However, the table does not provide information on how training participation specifically contributed to crop productivity improvement. Additionally, the mean value for training was higher than that of crop productivity improvement by a certain margin, raising doubt about the correlation between the two variables. Simple linear regression analysis therefore sought. The simple linear regression model was as follows:

$$\boldsymbol{y = \beta 0 + \beta 1 \times + \varepsilon} \text{ ..... } \textbf{(4.1)}$$

In this model, the response variable **y** represented crop productivity improvement while the explanatory variable **x** represented training participation. The term **ε** was the residual or error and represented deviation of observed values of crop productivity improvement from those approximated by the model. $\boldsymbol{\beta 0}$ and $\boldsymbol{\beta 1}$, were constants to be determined. Preliminary test on model **(4.1)** were satisfied. The model summary used to explain the variation in dependent variable (crop productivity improvement) that explained by independent variable (training participation). The results presented in Table 4.7.

Table 4.7: Regression Statistics for Training Participation and Crop Productivity Improvement

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.361	.087		4.133	.000
	Training participation	.677	.261	.234	2.598	.011
	Best line fit					
	R = .234[a]					
	R^2 = .055					
	Adjusted R^2 = .046					
	F_{ratio} = 6.750					
	P< .05[b]					

a. Dependent Variable: Crop productivity improvement
b. Predictors: (Constant), Training participation
Source: Research (2022)

The findings presented in Table 4.7 indicates a weak positive significant correlation (R = .234; p<.05) between training participation and crop productivity improvement. The R^2 value of the model was .055, suggesting that the training can attribute approximately 5.5% of the variation in crop productivity improvement provided vegetable farmers. The adjusted R^2 provided an idea of how the model generalized. The findings a show small difference of .009 or 9% between adjusted R^2 and R^2 from the model. This implied that if the model has derived from the entire population rather than a sample, then it could count for approximately .9% of the variance in results. The linear regression model was statistically significant (F_{ratio} =6.750; p < .05). Additionally, the findings revealed that the standard beta coefficient was .234, indicating that a one standard deviation increase in training participation led to a crop productivity improvement of approximately .234 units.

The simple linear regression equation between training participation and crop productivity improvement, as shown in Table 4.7 and model (**4.1**), is as below.

$$\mathbf{y = .361 + .677x} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \mathbf{(4.2)}$$

The simple linear regression model **(4.2)** provided a statistically significant correlation (R = .234; p<.05) between variation in farmers training participation and crop productivity improvement. The R square value of 0.55 in Table 4.7, suggested that the model explains 5.5% of the variation in training participation of vegetable farmers. Furthermore, the simple linear regression model indicates that without vegetable farmers training, crop productivity improvement measured at approximately .361 units, and farmers' participation in training led to a crop productivity improvement of .677 units.

This study revealed that human capital investment through training was positively influencing crop productivity improvement among vegetable farmers in Mlali village. This is in agreement with many studies done on human capital to investigate the contribution of HCI through training on crop productivity improvement. According to Ndour, (2017) human capital investment through training positively contributed to the improvement in crop productivity in Senegal. In addition, studies done by Mohaptra & Sen, (2013); Ndour, (2017) and Liu *et al*., (2020) show human capital through training has a positive impact on crop productivity improvement. Studies done by Liu, *et al*., (2020) also show training act positively on crop productivity improvement by allowing famers to better select inputs needed for crop productivity improvement.

Danquah & Quattara (2014) study was analyzing the effect of human capital through training in improving crop productivity. They found that the impact of training on crop productivity was zero. This contributed by the stock of human capital in SSA, which is largely unskilled leading to lower productivity growth. There is a need to further study on human capital investment and training needs of famers to identify areas that can best be implemented and led to increased crop productivity improvement in Mlali village.

4.5 Diffusion of Innovation

The study sought to identify how diffusion of innovation contributes to crop productivity improvement in the study area. The purpose was to find out how diffusion of innovation influences crop productivity improvement. This study also shows the source of information and methods preferred by vegetable farmers to

communicate production techniques and technology.

4.5.1 Source of Information about the Best Production Techniques and Technology

The study sought to identify the source of information about the best production techniques and technology. The purpose of this was to find out the popular source of information in the study area. The details shown in Table 4.8.

Table 4.8: Source of Information on Production Techniques and Technology (n=119)

Source of information	Frequency	Percent
Researchers	11	9.2
Extension officers	47	39.5
NGOs	12	10.1
Field days	6	5.0
Written publication	3	2.5
Electronic media	4	3.4
Other farmers	43	36.1
No source	9	7.6
Input suppliers	29	24.4

Source: Research Data (2022).

The respondents were required to choose the source of information they prefer on the best production techniques and technology. The findings shown on Table 4.8 indicated that majority 47 (39.5%) of the respondents received production techniques and technology from extension officers followed by 43 (36.1%) other farmers, 29 (24.4%) input suppliers, 12 (10.1%) NGOs, 11 (9.2%) researchers, 9 (7.6%) no source, 6 (5.0%) field days, 4 (3.4%) electronic media and 3 (2.5%) written publications. This result implies that majority of vegetable farmers received production techniques and technology information from extension officers.

This finding is similar to the findings of Churi *et al*., (2012) who reported that majority of smallholder farmers in Tanzania use extension officers to obtain

information related to crop production. Ashraf *et al*., (2019), reported similar result from the study done in Pakistan, which reported that, smallholder farmer's access information regarding agricultural practices from local extension officers. In addition, the findings from Peter *et al*., (2021) identified sources of agriculture production techniques and technology among smallholder farmers in Tanzania were from neighbors and local extension officers.

Other sources of information were input suppliers, electronic media and printed materials. This finding also does not differ much from the study of Mwalongo *et al*., (2020) who noted that farmers in Tanzania from 11 selected districts received information on improved production techniques like improved seed varieties from main six sources. Their study revealed that the first popular source of information was from their fellow farmers followed be research institute, extension officers, neighbors, mobile phones and lastly were seed suppliers.

4.5.2 Methods of Communicating Production Techniques and Technology

The study sought to identify the methods of communicating production techniques and technology. The purpose of this was to find out which method of communicating production techniques and technology in the study area preferred by farmers.

Table 4.9: Methods of Communicating Production Techniques and Technology (n=119)

Methods	Frequency	Percent
On-farm demo	87	73.1
Farmers field schools	33	27.7
Seminar and workshops	33	27.7
TV programmes	5	4.2
Individual farm visits	15	12.6
Written materials	9	7.6

Source: Research Data (2022)

The respondents were required to choose the method of communicating production techniques and technology they prefer in the study area. The finding shown in Table 4.9 indicated that majority 87 (73.1%) of the respondents preferred on farm demonstration as the method of communicating production techniques and technology followed by 33 (27.7%) farmers field schools and seminar and workshops respectively, 15 (12.6%) individual farm visits, 9 (7.6%) written materials and 5 (4.2%) TV programmes. This result implies that majority of farmers in the study area preferred on-farm demonstration method for communicating production techniques and technology.

This finding is similar to the findings from Peter *et al*., (2021) who reported that most farmers in Tanzania preferred field demonstration method for communicating agricultural techniques and technology followed by field exposure, lectures and written materials.

4.5.3 Contribution of Diffusion of Innovation toward Crop Productivity Improvement

The contribution of diffusion of Innovation toward crop productivity improvement analyzed, presented and interpreted. Descriptive statistical results of valid data items, means and standard deviations for diffusion of innovations and crop productivity improvement shown in Table 4.10.

Table 4.10: Descriptive Statistic for Diffusion of Innovation and Crop Productivity

	N	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Diffusion of Innovation	119	2.957	1.606	.185	.222	-1.367	.440
Crop Productivity Improvement	119	.584	.188	1.798	.222	1.254	.440

Source: Research Data (2022).

Findings from Table 4.10 show mean and standard deviation for diffusion of innovation (M = 2.957; SD = 1.606). There was a general agreement that farmers accepted innovation and technology in Mali village. Diffusion of innovations accepted when perceived better than the existing options, compatible with existing needs, easy to use, results are observable and tested. Table 4.10 also shows mean and standard deviation for crop productivity improvement (M = .584; S. D = .188). These showed that farmers in Mali village had improved crop productivity.

Table 4.10 also shows a test for normality of error distribution for the study variable diffusion of innovation and crop productivity improvement through skewness and kerossis. According to Demir (2022), the distribution of variables considered normal if its skewness falls in the range of ±2 and its kerosis falls in the range of ±7. These findings imply that variable diffusion of innovation and crop productivity improvement had their value of skewness and kerossis in the acceptable range. The normal test was therefore satisfied.

The findings in Table 4.10 show that vegetable farmers in Mali village accepted the use of new technology and innovation in crop production and there was crop productivity improvement, though it could not show how diffusion of innovation contributed to crop productivity improvement. Moreover, the mean for diffusion of innovation was higher than that of crop productivity improvement. This brings some doubt as to whether there was a correlation between them. Simple linear regression analysis therefore sought. The simple linear regression model was as follows:

$$\boldsymbol{y = \beta 0 + \beta 1 \times + \varepsilon} \quad \text{..... (4.3)}$$

The response **y** variable was crop productivity improvement and the explanatory variable **x** was diffusion of innovation. The term **ε** was the residual or error and represented deviation of observed values of crop productivity improvement from those approximated by the model. $\boldsymbol{\beta 0}$ and $\boldsymbol{\beta 1}$, were constants to be determined. Preliminary test on satisfying model **(4.3)** were satisfied. The model summary used to explain the variation in dependent variable (crop productivity improvement) that explained by independent variables (diffusion of innovation). The results presented in Table 4.11.

Table 4.11: Regression Statistics for Diffusion of Innovation and Crop Productivity Improvement

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.480	.035		13.860	.000
	Training participation	.035	.010	.300	3.402	.001
	Best line fit R = .300[a] R^2 = .090 Adjusted R^2 = .082 F_{ratio} = 11.572 P< .05[b]					
a.	Dependent Variable: Crop productivity improvement					
b.	Predictors: (Constant), Diffusion of innovation					

Findings in Table 4.11 show a relative small significant correlation (R = .300; p<.05) between diffusion of innovation and crop productivity improvement. The model's R^2 was .090; meaning that approximately, 9.0% of the variation in crop productivity improvement influenced by diffusion of innovations among potential adopters (vegetable farmers) of new introduced agricultural technology. The adjusted R^2 provided an idea of how the model generalized. The findings from this study show small difference between adjusted R^2 and R^2 from the model .008 or .8%. This implied that if the model derived from the population rather than a sample, then it

could have counted for approximately .8% less variance in results. The linear regression model was statistically significant (F ratio =11.572; $p < .05$). The findings also show that a standard beta coefficient was .300. This implied that for one standard deviation increase in diffusion of innovation, crop productivity improved by approximately .300 units.

Also the findings from Table 4.11 and model 4.3 have given the simple linear regression equation between diffusion of innovation and crop productivity improvement as below

$$\mathbf{y = .480 + .035x} \quad \textbf{(4.4)}$$

The simple linear regression model **(4.4)** provided a statistically significant correlation ($R = .300$; $p<.05$) between variation in diffusion of innovation and crop productivity improvement. As shown in Table 4.11, R square was .090, implying that the model was explained by 9.0% of the variation in diffusion of innovation among vegetable farmers in Mlali village. The simple linear regression model also shows that without diffusion of innovation, crop productivity improvement was relatively small and measured at approximately .480 units and the linear regression revealed that diffusion of innovation among vegetable farmers in Mlali village led to crop productivity improvement by .035 units.

This study revealed that diffusion of innovation was influencing the decision of farmers to adapt to new techniques and technology in crop production and therefore affecting crop productivity improvement in the study area. This finding concurs with Pambe (2022) who demonstrated a positive and significant relationship between

adoption of innovation and technology and productivity improvement in developing countries. This finding argued with a claim that the acquisition of external knowledge, ideas and new technology reduces cost of production and emphasizes the capabilities thereby improving the production capacity.

The finding also agreed with those of Inoue (2019) who found a statistically significant positive relationship between diffusion of agricultural innovation and productivity improvement among small-scale farmers in Vietnam. The studies done by Chavas & Nauges (2020) to investigate the contribution of DoI on crop productivity improvement noted that technology adoption in agriculture is an engine and important way to increase farm productivity. In addition, a study done by Pivoto *et al*., (2019) indicated that techniques and technology that had the best effect on crop productivity increase tend to have a greater acceptance among farmers.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This section summarizes the key research findings, conclusions and recommendations. The summary focuses on the findings in relation to the objectives of the study it intends to achieve. The summary followed by conclusion and then recommendations and suggestions for further research outlined in this section.

5.2 Summary of the Findings

The main objective of this study was to analyze the capacity development needs of vegetable farmers in Mlali Village that will help them improve crop productivity. The study has three specific objectives. First, to identify the needed trainings from vegetable farmers to improve crop productivity, second; to determine the contribution of human capital investment through training of vegetable farmers toward crop productivity improvement, and third, examine the contribution of diffusion of innovation toward crop productivity improvement.

The study found out that respondent in the study area had their most preferred training need area that they need to improve crop productivity. This study revealed that vegetable farmers in the study area mostly preferred training need on the area of accessing market information and the area perceived very important by many respondents. The level of competence on accessing market information was low in the study area followed by those respondents with none competence.

Besides accessing market information other training need areas in order of preference were fertilizer use, pest and disease control, planting methods and

irrigation, which perceived as very important, and majority farmers had low level of competence on these training needs. Furthermore, the results in this study indicated additional training needed by vegetable farmers in order of preference were; entrepreneur skills, managing finance, forming and managing self-help groups and small business development.

The study found out that vegetable farmers in Mlali village have been participating in several trainings related to crop production. This is because respondents agreed with the questions that; have you ever participated in any vegetable farming training and; was the knowledge and skills gained in the previous training improving your crop productivity. The result from this study indicated that training was found to have a weak positive correlation toward crop productivity improvement ($R=.234$; $P<.05$) between variations in training and crop productivity improvement. Training attributed approximately 5.5% of the variation in crop productivity improvement. The linear regression model between training and crop productivity improvement was statistically significant ($F_{ratio} = 6.750$; $P<.05$). There was statistically significant contribution of training of vegetable farmers to crop productivity improvement in Mlali village. Standardized beta coefficient showed that for every standard deviation increase in training, crop productivity improved by approximately .234 units.

Furthermore, the study was set to examine the contribution of DoI toward crop productivity improvement in Mlali village. The result from this study showed statistically significant weak correlation ($R=.300$; $P<.05$) between variations in diffusion of innovation and crop productivity improvement. Diffusion of innovation explained approximately 9.0% of the variation in crop productivity improvement.

The linear regression model between Diffusion of innovation and crop productivity improvement was statistically significant ($F_{ratio} = 11.572$; $P<.05$). There was statistically significant contribution of diffusion of innovation among vegetable farmers toward crop productivity improvement in Mlali village. Standardized beta coefficient showed that for every standard deviation increase in diffusion of innovation, crop productivity improved by approximately .300 units.

5.2.1 Implications of the Findings on the Needed Trainings from Vegetable Farmers to Improve Crop Productivity

The findings of the study suggested that in the study area, vegetable farmers have identified specific training needs to improve crop productivity. Furthermore, the study indicated that there is a need for additional training on entrepreneur skills, managing finance, forming and managing self-help groups and small business development among vegetable farmers. The implications of these findings suggested that there is a significant need for targeted training programmes and support in the identified areas to enhance crop productivity and improve the overall competence of vegetable farmers in the study area.

5.2.2 Implications of the Findings on Contribution of Human Capital Investment through Training of Vegetable Farmers toward Crop Productivity Improvement

The findings of the study suggested that vegetable farmers in Mlali village have actively participated in various trainings related to crop production. The results of this study showed the contribution of human capital through training toward crop productivity improvement was evident though were small. The overall implication of

these findings is that while training prays a role in improving crop productivity, other factors may also influence the overall improvement. Therefore, adopting a comprehensive approach that considers specific farmers' need and other factors in crop production to enhance crop productivity in Mlali village is fundamental.

5.2.3 Implications of the Findings on the Contribution of Diffusion of Innovation toward Crop Productivity Improvement

The findings of the study indicated that the Diffusion of Innovation was influencing the decision of famers to adapt to new techniques and technology in crop production and therefore affecting the level of crop productivity improvement in the study area. However, the contribution of Diffusion of Innovation to crop productivity improvement though evident was small. Overall, the implication of these findings suggested that promoting and supporting diffusion of innovation among vegetable farmers in Mali village could contribute to improving crop productivity. However it is important to note that the correlation and contribution are relatively weak, indicating other factors may also influence crop productivity in the village.

5.3 Conclusions

This study concluded that several training needs identified as very important for vegetable farmers, with the highest priority being training on accessing market information, followed by fertilizer use, pest and disease control, planting methods and irrigation. Additionally, farmers expressed a preference for additional training in entrepreneur skills, managing finances, forming and managing self-help groups, and small business development. Furthermore, the study concluded that training has a statistically significant weak correlation with crop productivity improvement in the

study area. While training of vegetable farmers does explain some of the variation in crop productivity improvement, the contribution of training towards this improvement is small.

The study emphasized the importance of training in enabling farmers to acquire the necessary knowledge and skills for improving crop productivity. The study also found a statistically significant weak correlation between the diffusion of innovation and crop productivity improvement. While diffusion of innovation does explain some of the variation in crop productivity improvement, its contribution is also small. In summary, the study concluded that training and diffusion of innovation have a limited but evident impact on crop productivity improvement. The identified training needs, particularly in accessing market information and key agricultural practices identified, should be prioritized to support farmers in improving their crop productivity.

5.4 Recommendations

Based on the findings of this study, the following recommendations suggested;

i) Training and diffusion of innovation both contributed to crop productivity improvement in Mlali village. The study therefore recommends the government and other stakeholders should prioritize and enhance training and diffusion on innovation to promote sustainable crop productivity improvement in the study area.

ii) The concerned stakeholders should pay relatively higher emphasis on those specific most important training needs as identified in this study while formulating different training strategies and programmes for the famers in the

study area.

iii) To gain a comprehensive understanding of crop production techniques and technological requirements of farmers, an extensive research programme should be conducted in other vegetable crop growing areas in Tanzania. This will help identify appropriate practices and technologies that could be implemented to enhance crop productivity.

iv) Encouraging and strengthening regular visits by extension officers accompanied by demonstration plots recommended. This communication channel found to be popular among farmers in the study area for disseminating information related to crop production. This approach can effectively facilitate knowledge transfer and adoption of best practices.

v) Recognizing that capacity development is a broad field, the government and other stakeholders involved in agriculture should invest in research to identify specific capacity development needs that could be utilized to promote sustainable crop productivity improvement. This will ensure that resources allocated efficiently and effectively to address the identified needs.

5.5 Area for Further Research

Further research should focus on exploring the impact of training and diffusion of innovation in enhancing crop productivity improvement and identifying training needs among vegetable farmers in different vegetable crop growing areas in Tanzania. The current study specifically examined one vegetable crop growing area, but conducting similar research in other areas will provide a more comprehensive understanding of the topic. Replicating the study in different growing areas is

essential to validate and generalize the findings, as different areas may yield varying results.

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APPENDICES

APPENDIX I: Questionnaire for Mlali village vegetable farmers

A questionnaire for vegetable farmers at Mlali village in Mvomero District

GENERAL INFORMATION

Questionnaire number_____

Village: _____ Sub-village:_____

Division: _____ Ward: _____

Date: _____

SECTION A: SOCIAL-ECONOMIC HOUSEHOLD CHARACTERISTICS

Kindly tick [√] in the box next to the right option

A_1: Gender: Male [ ] Female [ ]

A_2: Age of respondent

< 20 [ ] 40 - 49 [ ]

20 – 29 [ ] >49 [ ]

30– 39 [ ]

A_3: Marital status of respondent

Single [ ] Married [ ]

Separated/divorced [ ] Widow/widower [ ]

A_4: You are highest level of education

Never gone to school [ ] Primary education [ ]

Secondary education (form IV) [ ] Secondary education (form VI)[ ]

Certificate [ ] Diploma [ ]

University [ ] Adult education [ ]

A_5: Farmer household composition (including relatives, house girls, house boys etc.)

Age group	**Number of house member**	**Number of member separated by sex**	
		Male	**Female**
Adult (≥ 18 years)			
Children (11 – 18 years)			
Children (< 10 years)			
Total			

A_6: What is your primary occupation?

None [ ] Farmer [ ] Agricultural labourer [ ] Shop owner [ ]

Bodaboda [ ] Mamantilie [ ] Tailor [ ] Raising livestock [ ]

Houseworker [ ] Driver [ ] Others [ ]

Specify_____

A_7: mention household source of income

Sources of income	Rank
1. Sales of maize	
2. Sales of vegetable crops	
3. Sales of livestock products	
4. Sales of chicken	
5. Employed (e.g. teacher, Nurse, security guard)	

Others

Specify_____

SECTION B: FARMING AND LAND ALLOCATION PARTTERN

B_1: Do you have access to land for vegetable cropping? (Tick [√] one)

(a) Yes [ ] (b) No [ ]

B2: Have you purchased, rented or inherited the land you are farming?

(a) Purchased [ ] (b) Rented [ ] (c) Inherited [ ]

B3: How big is your land area? _____ (acres)

B4: How big is your land cultivated with vegetable crops? _____ (acres)

B5: what crops do you grow on your land?

_____ _____ _____ _____ _____

Crop code: 1. Tomatoes 2. Watermelon 3. Onions 4. Cucumber 5.Carrots 6.Cabbage 7. Sweet pepper 8. African eggplant 9.Others

Specify_____

B_6: when did you start growing vegetable crops? (State the year)_____

B_7: Why do you grow vegetable crops?

1. Source of food [ ]
2. Decorations [ ]
3. Source of income [ ]
4. Main staple food [ ]
5. Source of livestock feed [ ]
6. Source of both food and income [ ]
7. Others [ ]

Specify: _____

_____

_____

SECTION C: CAPACITY DEVELOPMENT NEEDS

C_1: Human capital investment

$C_{1.1}$: have you ever participated in any vegetable farming training?

1. Yes [ ] 2. No [ ]

$C_{1.2}$: If no why?

1. Not invited [ ]
2. Lack of interest [ ]
3. Lack of time to attend [ ]
4. Others [ ]

Specify _____

$C_{1.3}$: was the training adequate? 1. Yes [ ] 2. No [ ]

$C_{1.4}$: Was the knowledge and skills gained in the previous training improving your crop productivity? 1. Yes [ ] 2. No [ ]

$C_{1.5}$: What major trainings do you still need on vegetable production?

Please cycle all areas in which you need training. Then tick in the boxes for your current competence in these areas and how important you think the training is.

Area	Current knowledge (Competence)					Importance of area		
	None	Low	medium	High	Very high	Not important	Important	Very important
1.Selecting and buying inputs								
2.Land preparation								
3.Planting methods								
4.fertilizer use								
5.Pests and diseases control								
6.Irrigation								
7.Harveting								
8.Storage of vegetable crops								
9.Accessing market information								

$C_{1.6}$: Other areas of training

Please cycle all areas in which you need training. Then tick in the boxes for your current competence in these areas and how important you think the training is.

Area	Current knowledge (Competence)					Importance of area		
	None	Low	medium	High	Very high	Not important	Important	Very important
1.managing finances								
2.Enterpreneur skills								
3.Small business development								
4.Forming and managing self-help groups								
5. No training needed								

C_2: Diffusion of innovation

$C_{2.1}$: What are the sources of information about the best production techniques and technology?

1. Researchers [ ] 2. Extension officers [ ]
3. NGOs [ ] 4. Field days [ ]
5. Written publications [ ] 6. Electronic media [ ]
7 Other farmers [ ] 8. No source [ ]
9. Input suppliers [ ] 10. Others [ ]

Specify: _____

$C_{2.2}$: What methods of communicating production techniques and technology do you prefer? (Tick 5 most important)

1. On-farm demonstrations [ ] 2. Farmer field schools (FFS) [ ]

3. Seminars and workshops [ ] 4. TV programmes [ ]

5. Individual farm visits [ ] 6. Written materials [ ]

7. Radio programmes [ ] 8. Others [ ]

(specify_____

$C_{2.3}$: What is the reason for you to accept or reject new technology and innovations? Tick in the boxes where you think is appropriate. **Key Note:** 1 = Strongly Agree, 2 = Agree, 3 = Disagree, 4 = Strongly Disagree

Area	Accept				Reject			
	Strongly Agree	Agree	Disagr	Strongly disagree	Strongly agree	Agree	Disagre	Strongly disagree
1.Better than existing options (Relative advantage)								
2.Consistance with existing needs (Compatibility)								
3.Easy to understand (Complexity)								
4.Results are visible (Observability)								
5. It can be tested (Testability)								

THANK YOU

Appendix 2: Research Clearance Letters

THE UNITED REPUBLIC OF TANZANIA

PRESINDENT'S OFFICE
REGIONAL ADMINISTRATION AND LOCAL GOVERNMENT

Telegraphic Address: "REGCOM"
Phones: 2934306/2934305
Fax No: 2601308/2604988
Website: www.morogoro.go.tz
Email: ras.morogoro@tamisemi.go.tz
In Reply please quote:
Ref. No: AB. 175/245/01/92

Regional Commissioner's Office,
Boma Road
P. O. Box 650,
67117 MOROGORO

22nd June, 2022

District Administrative Secretary,
Mvomero.

Re: RESEARCH PERMIT

Please refer to the above mentioned subject.

2. I am introducing to you **Mr. Lilanga, Saku, Reg. No: PG201986456 the** student of Open University of Tanzania, who are at the moment required to conduct research.

3. The title of the research is **"Identifying Capacity Development Needs among Vegetable Farmers in Morogoro for Improving their Crop Productivity: A Case of Mlali Village"**

4. The research permit is valid from **August, 2022** to **September, 2022** and will cover Mvomero District.

5. Please provide necessary assistance to enable the accomplishment of the research.

6. Thank you for your cooperation.

Jacob A. Rayange
For; **Regional Administrative Secretary**

Copy: Director,
Post of Postgraduate,
P.O. Box 23409,
Dar es Salaam.

" Researcher.

TANZANIA SENSA 23 Agosti 2022 Jiandae Kuhesabiwa

Jiandae kuhesabiwa siku ya Jumanne tarehe 23 Agosti, 2022