FACTORS AFFECTING THE ADOPTION OF DRIP IRRIGATION TECHNOLOGY: EMPIRICAL EVIDENCE FROM HORTICULTURAL PRODUCTION PROJECT IN MAGHARIBI "A" DISTRICT OF ZANZIBAR

AMOUR UZZI VUAI

A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF PROJECT MANAGEMENT (MPM)

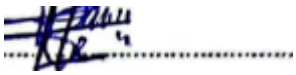
DEPARTMENT OF MARKETING, ENTREPRENEURSHIP AND MANAGEMENT

OF THE OPEN UNIVERSITY OF TANZANIA

2023

CERTIFICATION

The undersigned certifies that he has read and hereby recommends for acceptance by the Open University of Tanzania a dissertation titled; **"Factors affecting the adoption of drip irrigation technology: empirical evidence from horticultural production project in Magharibi "A" District of Zanzibar",** in partial fulfillment of the requirements for the degree of Master of of Project Management (MPM).



Dr. Juma Matonya

(Supervisor)

15/08/2023

……..……

Date

COPYRIGHT

DECLARATION

I, **Amour Uzzi Vuai,** declare that, the work presented in this dissertation is original. It has never been presented to any other University or Institution. Where other people's works have been used, references have been provided. It is in this regard that I declare this work as originally mine. It is hereby presented in partial fulfillment of the requirement for the Degree of Masters of Project Management (MPM).

…….
Signature

15/08/2023
……..……
Date

DEDICATION

I dedicate this work to almighty God the creator of everything we see and not see for allowing me to finish this research work. I also dedicate this research to my wife Mkasi Ali Haji, my daughters Zulekha Amour Uzzi, Asma Amour Uzzi, Thamra Amour Uzzi and Fatma Amour Uzzi, also my sons Ahmed Amour Uzzi and Anuari Amour Uzzi. Lastly, I dedicate to my Brother Slemani Mwazini Makame for their entire support and encouragement which has helped me to complete my dissertation.

ACKNOWLEDGEMENTS

I am grateful to the Almighty God the creator of everything for keeping me alive and in good health. I wish to express my sincere thanks to my supervisor Dr. Juma Matonya for his guidance, constructive criticisms, comments and patience throughout the whole period of research work to the preparation of this document. Without his assistance this work would have not been possible. May the Almighty God bless him.

I have to express my thanks to the Director of irrigation Zanzibar Mr. Haji Hamid Salehe for giving me good support for the long period since the start of this course to the Open University of Tanzania. I would like to express my thanks to the Ministry of Agriculture, irrigation, Natural Resources and livestock Zanzibar, my employer for granting me a study leave during the whole period of my study. I also thank the Agricultural District Development Officer (DADO) at Magharibi "A" District of Zanzibar for allowing me to collect data in their administrative areas. Thanks should also go to study respondents who spent their entire time during data collection exercise period.

ABSTRACT

This study sought to investigate what factors influence smallholder farmers in Magharibi "A" District in Zanzibar to use drip irrigation technology. The study specifically sought to examine the influence of perceived usefulness on the intention to use drip irrigation technology, to examine the influence of perceived ease of use on the intention to use drip irrigation technology in the study area, to pinpoint the influence of farmer's attitude on the intention to use drip irrigation, and discover the influence of social pressure on the intention to use drip irrigation. The study was carried out in 18 Shehia of Magharibi “A” district, whereby 165 respondents were simple randomly selected for the study. Data were collected from smallholder farmers using questionnaires. Descriptive and multiple linear regression analysis were applied to analyze the collected data. The findings reveal that, perceived usefulness, perceived ease of use, farmer’s attitudes and social influence has positive influence on the intention to use drip irrigation system among smallholder farmers in the area of the study. The study concludes that perceived usefulness, perceived ease of use, farmer’s attitudes and social influence are antecedents of intention to use drip irrigation technology. Thus, the study recommends that more efforts be made to help smallholder farmers perceive drip irrigation technology as useful and simple to use, have positive attitudes toward using the technology, and take advantage of favorable social influence regarding its use.

Keywords: *Perceived Usefulness, Perceived Ease of Use, Farmer’s Attitudes, Social* Influence, *Drip Irrigation Technology.*

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATION

ZSGRP	Zanzibar Strategic for Growth and Reduction of Poverty
A U	Africa Union
OC G S Z	Office of the Chief Government Statistician Zanzibar
DOI	Department of irrigation
TAM	Technology Acceptance model
PU	Perceived Usefulness
PEU	Perceived Ease of Use
CAS	Computerized Accounting System
MESS	Micro and Small Enterprises
EV	Economic Vulnerability
MIT	Modern irrigation technology
DAAR	District Annual Agricultural Report
IVS	Independent variables
DV	Dependent variable
VIF	Variance Inflated Factor
FAO	Food and Agriculture Organization
NGOs	Non-Governmental Organization
DADO	Agricultural District Development Officer

CHAPTER ONE

INTRODUCTION

1.1 Background to the Problem

Agriculture is an important economic sector in developing countries as it provides livelihood support to 60-80% of the population and makes a significant contribution to national incomes and economic growth (Hossain, Lixue, Uddin,Dan, Haisheng,& Siping, 2017). However, in recent decade the rainfall is unreliable and insufficient in many areas including Sub-Saharan Africa where Agriculture is largely rain-fed (Canavari, Medici, Wongprawmas, Xhakollary, & Russo, 2021). Due to the Climate change resilience, rainfall has become unreliable and droughts are globally becoming common while crop production in most of the countries is inherently risky (Hossain et al., 2017).

Availability of fresh water for agriculture has been diminishing in the world and that the costs for water resources development have been steadily on the rise. However demand for agricultural product is becoming high, so more water is needed to produce food and vegetables to meet the current demand both for food consumption as well as economic growth (AU, 2020). The unreliability of rainfall means that there is a need to shift agricultural production from rain fed to irrigated crop production.

Fue & Sanga, (2015), point out that drip or trickle irrigation practices are very common and are considered the most potential and water efficient system compared to other irrigation systems due to the global fresh water scarcity. Drip irrigation practices seem to be the solution to address the water scarcity problem existing in

many places including Zanzibar. While the need for small-scale irrigation development to produce enough agricultural products in response to market demand brought by rising population and increasing consumer income is important, this has to be accomplished amidst both physical and economic water scarcity problems (Shakila&Vaidegi, 2019). In East Africa, agricultural sector is major social and economic sector to improve livelihood and eradicate poverty. The performance of the agricultural sector could rise significantly by adopting modern drip irrigation practices (Fethi, 2016). Use of water in agriculture especially drip irrigation farming is very important for vegetables production and to decrease risk of drought.

In Tanzania, a drip irrigation practice is mainly based in horticultural crops which play important role in the agricultural economy. Generally, agriculture has remained the predominant sector in Tanzania and has been instrumental in poverty reduction, accounting for 26.7 percent of Tanzania's GDP in 2020. According to Office of the Chief Government Statistician Zanzibar (OCGSZ, 2017) agriculture remains an important economic sector, both its contribution to food self-sufficiency and for household income. It provides employment to the most of the Isle's labour force with 37.8% of rural population being engaged in agricultural production and about 80% of the total population drives their livelihood directly or indirectly from the sector.

Moreover, for a long time smallholder farmers in Zanzibar have been dealing within irrigation of paddy with low attention on vegetable production. This situation has led to the loss of economic growth from vegetable production through micro-irrigation. At present the Department of irrigation in Zanzibar has the responsibility to provide

education and encourage farmers on micro-irrigation practices such as drip irrigation for horticultural crops (DOI, 2017). Drip irrigation seems to be the best option as studies show that there are limited ground water in the Island (Rubea, 2015).

However, drip irrigation technology has been introduced in recent years in Zanzibar. Thus, there is a need to conduct studies relating to its acceptance and performance. Understanding the most important factors that determine the decision of farmers in adopting water saving technologies such as drip irrigation helps to realize sustainability in water management in agriculture. Studies in other countries reveal that, acceptance of new technology is affected by different factors including performance expectancy, social influence, facilitating conditions (Nejadrezaei, Allahyari, Sadeghzadeh, Michailidis, and Bilali, 2018), perceived ease of use, perceived usefulness, attitudes, and purchase intention (Ma, Gam, &Banning, 2017) and extension services, social capital (Wang, Bjornlund, Klein, Zhang, & Zhang, 2016) to mention a few.

However, since acceptance of technology differs from one location to another and from technology to technology, this study is proposing that perceived usefulness, perceived ease of use, attitude of farmers towards drip irrigation and the social influence affects the decision of farmers in Zanzibar to adopt drip irrigation. In examining whether these factors affects acceptance of drip irrigation or not, the Technology Acceptance Model (TAM) was be applied. The TAM is known to be the better model to determine whether the user will be able to accept the new technologies and nicely capture the user's aptitude to deal with technology and assists managers and other decision-makers to measure the success of the

introduction of technology.

1.2 The Statement of the Problem

Water scarcity and sustainable water management is one of the major concern that human kind is facing (Wheeler, Bark, Loch & Connor, 2015). Water scarcity is distressing about four billion people in the world and water insufficiencies are becoming one of the major socio-environmental problems globally (De Angelis, Metulini, Bove, Riccaboni, 2017; Hoekstra & Mekonnen, 2016). Climate change, population growth, desertification and urbanization are exacerbating water scarcity issues especially in arid and semi-arid regions (Pronti, Auci, Di Paola &Mazzanti, 2019). One of the major strategies to overcome this situation is through irrigation system when farmers are engaged in the agricultural undertakings.

In this setting, innovations and water saving technologies can greatly support the reduction of the impacts of agricultural activities on water resources. One of the major questions for realizing sustainability in water management in agriculture is to understand the most important factors that determine the decision of farmers in adopting water saving technologies such as drip irrigation in their irrigation schemes. Thus, this study focuses on finding the major determinants of farmers' adoption of drip irrigation in Magharibi "A" district of Zanzibar. To the best understanding of the author, the factors affecting adoption of drip irrigation in the study area are not well known. Hence, this study aimed at filling this gap.

1.3 Objectives of the Study

1.3.1 General Objectives

To determine the factors affecting the adoption of drip irrigation technology among

smallholder farmers at Magharibi “A” District.

1.3.2 Specific Objectives

i. To determine the effect of perceived usefulness on the intention to adopt drip irrigation technology.
ii. To determine the effect of perceived ease of use on the intention to use drip irrigation technology in the study area.
iii. To determine the influence of farmer’s attitude on the intention to use drip irrigation.
iv. To determine the effect of social pressure on the intention to adopt drip irrigation

1.4 Significance of the Study

The findings of this study are potential for updating the strategies in the Agricultural sector policy of 2002 and Zanzibar Food security and Nutrition policy of 2008. They are also beneficial for decision and policy makers of the Ministry of Agriculture for planning and intervention strategies on using modern technology to improve horticultural crop production, smallholder farmer’s income, standard of living, nutrition and poverty alleviation at household and national level. Hence, practical contributions of this study are on food security sustainability and environmentally friendly practices. By implementing sustainable agriculture methods, the long-term health of ecosystems is preserved, ensuring that future generations can meet their food needs. Furthermore, climate change poses significant challenges to food security, therefore this study’s contributions focuses on developing climate-resilient agricultural practices, crop varieties and water management strategies to mitigate the

impact of climate-related disruptions on food production.

1.5 Organization of the Study

The next section comprises of chapter two which presents the definition of key terms, theoretical and empirical literature review. The methodology of this study is presented in chapter three research methodologies. Among others the methodology chapter describes the research approach, research design, study area, study population, sampling procedures, sample size, data collection methods, pilot study, data analysis procedure, reliability and validity as well as ethical consideration. Thereafter chapter four which discusses the findings of the study is also presented. In addition, the discussion of the findings has been presented in chapter five and the conclusion and recommendations are described in chapter six.

CHAPTER TWO

LITERATURE REVIEW

2.1 Overview

This chapter presents the definition of key terms, overview of reviewed literatures including the theoretical literature review and empirical literature. It also presents the conceptual framework, the research gap and definition of the key terms.

2.2 Definition of the Keyterms

2.2.1 Drip Irrigation

Drip irrigation is a modern technology of crop irrigation that involves a controlled delivery of water to plants through system of pipe, valves, tubing and emitters. The water is delivered from a source directly to the root zone of individual plant to the surface of the soil (Gorain, Singh, Kumar, Venkatesh, &Jha, 2018).

2.2.2 Horticultural Production

Horticultural production is the science and art of the development to acquire sustainable production, marketing and use of high value, intensively cultivated food and ornamental plants including fruits and vegetable (Kasso&Bekele, 2016). Horticultural production is mainly produces a variety of fruits, leafy vegetables, roots and tubers in the society for the purpose of household consumption, marketing and income generation for small holder farmers.

2.2.3 Perceived Ease of Use

Perceived ease of use is defined as the degree to which a person feels and perceives using a particular system free of effort (Lanlan, Ahmi & Popoola, 2019). Perceived

ease of use represents the extent to which users believe that using the technology will be effortless and easy to understand (Davis 1989). A technology that is perceived as easy to use is more likely to be adopted, as users will feel more confident in their ability to use it effectively.

2.2.4 Perceived Usefulness

is defined as the subjective perception of smallholder farmers where they believe that using certain technology can improve the performance of their farming (Ohk, Park, & Hong, 2015). This variable refers to the degree to which an individual believes that using a specific technology or system will enhance their job performance, improve efficiency. Perceived usefulness is a crucial determinant of technology adoption because users are more likely to adopt a technology they perceive as useful.

2.2.5 Farmers Attitude

Attitude is defined as psychological farmers construct or a mental and emotional entity that characterizes a person, place, thing or event which in turn influences the farmers thought and action (Das, Islam & Billah, 2019). Farmer’s attitude to use is the user's intention or willingness to adopt and use the technology. It serves as a direct predictor of actual technology adoption. If farmers have a positive intention to use the technology based on their perceptions of usefulness and ease of use, they are more likely to adopt it.

2.2.6 Social Pressure

Social pressure is defined as intentional and unintentional effort to change other

persons believes attitudes. It takes a wide variety of forms including obedience, conformity, persuasion, social loafing and peer pressure (Wu, Huang & Shyu, 2021).

2.3 Theoretical Literature Review

This section covers the review of Technology Acceptance Model (TAM) which was used by this study.

2.3.1 Technology Acceptance Model

The Technology Acceptance Model (TAM was developed by Davis in 1989 and has become one of the extensively used models in researching acceptance of technology because it is simpler and easier to implement (Latipa, Omara, Jinga & Shahromb, 2017). Davis stipulated that perceived usefulness (PU), perceived ease of use (PEU), attitude towards use, intention to use and behavioral intention to use impacts the adoption of the technology (Gotifridi & Magali,2021). TAM model has been expanded by a number of researchers to include other variables such as demographic variables (Omol, Abeka & Wauyo, 2017; Akinyemi & Mushunje, 2020), social pressure, community trust and culture (Wamuyu, 2014), education (To & Trinh, 2021; Burke, Goldman, et al., 2016), consumers' awareness (Sudhir, Pandey & Tewari, 2012; Abdinoor & Mbamba 2017), preference (Kumar & Seri, 2014).

However, this study proposed that perceived usefulness (PU), perceived ease of use (PEU), attitude towards use and social influence are likely to influence the adoption of drip irrigation technology in Magharibi "A" District of Zanzibar. It was believed that if the farmers perceive that using drip irrigation system is useful and will enhance smallholder's productivity, and then farmers would adopt the technology.

On the one hand, if smallholder farmers perceive the ease of use of drip irrigation then they would be ready to use it. In the same vein, attitude towards use of drip irrigation and social pressure exerted from other individuals will arouse the intention to use the drip irrigation. The TAM model was relevant to this study because is simpler and easy to implement.

According to Nejadrezaei, Allahyari, Sadeghzadeh, Michailidis and Bilali (2018) TAM helps to determine whether the user will be able to accept the new technologies and user's aptitude to deal with it and assists managers and other decision-makers to measure the success of the introduction of technology to the organization, and motivate users to accept the systems. Thus, the TAM was used to enhance the understanding of the acceptance and use of drip irrigation system in Magharibi "A" District of Zanzibar.

2.4 Empirical Literature Review

This section presents the empirical findings regarding factors influencing the adoption of technology.

2.4.1 Relationship between Perceived Usefulness and Technology Acceptance

A number of studies have examined the influence of perceived usefulness on technology acceptance. Studies by Francisco and Juan (2015) found that perceived usefulness has direct effect on technology users. Cheng and Huang (2013) also revealed that perceived usefulness allied with mobile ticketing services has a positive and direct influence on technology usage behavior. Similarly, Hamida, Razak, Bakar and Abdullah (2015) studied the influence of perceived usefulness on

continuance intention to use technology specifically the e-government in Malaysia. The study used a total of 543 government servants teaching public schools and analyzed data using multiple regression analysis. The findings from this study indicate that perceived usefulness positively influences continuance intention to use e-government.

The study by Uwizeyimana (2018) found that majority of the farmers use drip irrigation technology to increase the food production during their farming. This technology improves soil nutrition through incorporation of soil which had a significant impact on resources saving, cost of cultivation, yield of crops and farm profitability. Based on the above literature, the more useful is the technology in this case drips irrigation to people, the more the technology is accepted. Thus, it is hypothesized that:

H1: Perceived usefulness has positive and significant influence on intention to use drip irrigation.

2.4.2 Relationship between Perceived Ease of use and Technology Acceptance

Hamida, Razak, Bakar and Abdullah (2015) studied the influence of perceived ease of use on continuance intention to use technology specifically the e-government in Malaysia. The study used a total of 543 government servants teaching public schools and analyzed data using multiple regression analysis. The findings from this study indicate that perceived ease of use positively influences continuance intention to use e-government. Based on all of the above, the easier it is for people to use drip irrigation, the greater their acceptance on this technology.

Ohk, et al., (2015) found that perceived ease of use significantly influence the high level of use of Computerized Accounting System(CAS) by accountant in Micro and Small Enterprises(MSEs) in Xian and Shaan Xi China. The study concluded that there is positive relationship between perceived use of use and the use of CAS by accountant. Therefore, this study hypothesized that: H_2: Perceived ease of use had positive and significant influence on intention to use drip irrigation.

2.4.3 Relationship between Attitude and Technology Acceptance

Hussain (2017) investigated the attitude of university student about the use of E-learning based on the technology acceptance model. The result of this study indicates that there is positive relationship of university students intention to use E-learning with three antecedents namely attitude, perceived usefulness and perceived ease of use. The finding of the study indicated that attitude was a significant predictor toward student's intention to use E-learning. As a result, it is seen that student attitude plays an important role in contributing to the intention to use E-learning system.

A case study of drip irrigation done in Tamil Nadu, India by Kaarthikey & Suresh (2019) found that majority of the famers have positive attitude and willing to use modern drip irrigation system because it helps for the maximum use of available water, reduces evaporation of water compared to other type of irrigation, reduces labour cost and use of fertilizer as the fertilizers are directly sent through the pipes to the roots instead of throwing in the land. Thus, this study hypothesizes that: H3: Attitudes towards use has positive and significant influence on intention to use drip irrigation. In turn, behavioral intention to use significantly impacts the actual system

use or technology adoption. The model assumes that users rationally evaluate the potential benefits (usefulness) and the perceived effort required (ease of use) before deciding whether to adopt the technology. The user's intention to adopt the technology is considered a key predictor of their actual technology adoption behavior.

2.4.4 The Influence of Social Influence on the Intention to use Drip Irrigation

Mike (2018) in his study of social economic and administrative factors influencing adoption of irrigation technology in Tharaka Nithi county Kenya found that age, gender, size of the land cultivated, years of residence and education level did not have significant relationship with decision to adopt or not to adopt irrigation technology implying that they overall did not influence adoption decision. On other hand the study illustrated that membership to farmers group, information access, land tenure and external support had a significant relationship, implying that they really affected farmer’s decision to adopt or not to adopt drip irrigation technology. This means that smallholder farmers can be influenced to adopt drip irrigation technology through social groups, farmers group and media access.

In Gansu Province, China the study on relationship of social influence and intention to use drip irrigation technology showed that the external social influence has a significant negative impact on adapting modern irrigation technology (MIT) by rural farmers (Tan, Rahman, Qiaa, Hussain & Magzhan, 2021). At the same time the study found that economic vulnerability (EV) of the farmers plays an intermediary effect in increasing the impact of external irrigation on the adaptation of MIT. The risk-taking network has a moderate effect on the relationship between external

shocks, affecting farmers to adopt MIT, while external shocks also increase EV which affects farmers' adopting MIT (Wu, et al., 2021).

Haji, et al., (2021) revealed that the variables attitude of social groups have significant positive influence on behavioral intention towards accepting drip irrigation technology. The significant effect of attitude towards social groups on explaining farmers' intention towards acceptance of drip irrigation technologies implies that they reinforcing farmers' to increase the likelihood of activating their behavioral intention to use these new drip irrigation methods. Thus, the current study hypotheses that, H4: Social influence has positive and significant influence on intention to use drip irrigation.

2.5 Research Gap

Research gap is a question or a problem that has not been answered by any of the existing studies or research within the field (Wolf, 2019). Sometimes, a research gap exists when there is a concept or new idea that has not been studied at all. Enormous research has been undertaken in regard to issues on factors affecting adoption of drip irrigation system but little has been dedicated to assess the influence of perceived usefulness, ease of use, attitude and social influence on the intention to adopt the drip irrigation technology. Therefore this study aimed at filling this research gap by adopting a quantitative research approach to examine the influence of perceived usefulness, ease of use, attitude and social influence to use drip irrigation technology particularly in developing countries like Tanzania.

On the other hand, majority of studies regarding technology acceptance have considered perceived usefulness and perceived ease of use as major factors affecting

the intention to adopt technology. Different from many other studies, this study will also add the attitude towards use and social influence to ascertain how these variables influence the intention to use technology particularly drip irrigation and add knowledge to the agrarian and environmental literature. Moreover, the reviewed literature indicates that, majority of studies regarding technology adoption have concentrated studying the farmer's adoption in the developed countries leaving the developing countries such as Tanzania under-searched. Thus, this study was an attempt to fill this contextual gap.

2.6 Conceptual Framework

Figure 2.1 explains the relationship between the variables. It proposes that perceived usefulness, perceived ease of use, farmer's attitudes and social influence influences the intention of farmers to use drip irrigation.

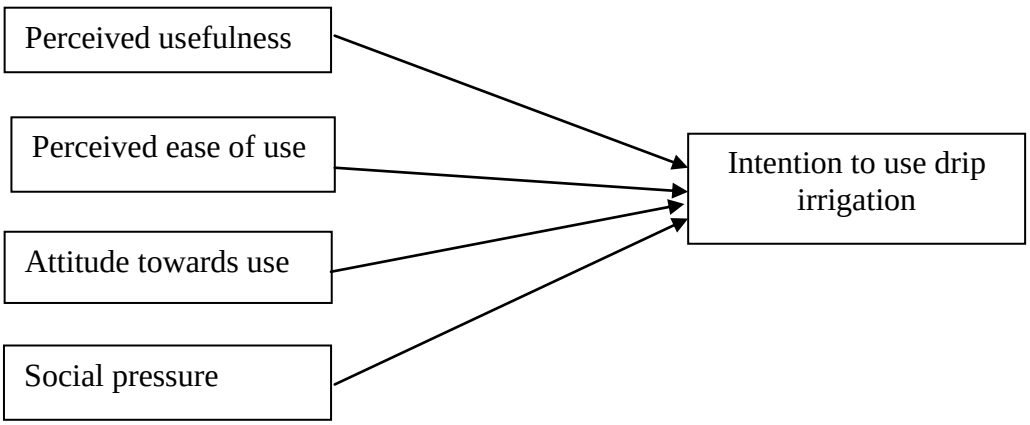


Figure 2.1: Conceptual Framework Diagram

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Overview

This chapter explains the methodology to be used in this study including research design, study area, research hypotheses, study population, sampling techniques and sample size, data collecting methods and procedures, reliability and validity issues, data analysis and processing and ethical considerations.

3.2 Research Approach

This study used a deductive research approach. The researcher formulated hypothesis based on existing theories or prior knowledge and then collected data to either support or refute the hypothesis. Using a deductive approach enabled the researcher to explore the known phenomena, and explain the relationship between the different variable and concepts, as well as to generalize the findings to the greater extent. The researcher used a deductive approach due to its usefulness for testing and refining existing theories and generating empirical evidence to support or challenge them. The deductive research approach was particularly useful because the researchers aim to confirm or disconfirm existing theories, test specific hypotheses and contribute to the body of knowledge in a systematic and objective manner. It provided a structured and logical framework to generate valuable insights and advance the understanding of various phenomena.

3.3 Research Design

Research design is the procedure for collecting; analyzing, interpreting and reporting of data in research studies (Lelissa, 2018). This study used an explanatory research

design in a cross- sectional survey. This was a blueprint or framework that guided the entire research process, from the formulation of hypotheses to the data collection, analysis, and interpretation of results.

3.4 Area of the Study

The location of the study was Magharibi “A” District of Zanzibar previously known as Magharibi District of Unguja. The District was purposively selected because of having a high concentration (93.9%) of households growing crops and keeping livestock as major economic activities and its good area for production of horticultural crops.

3.5 Survey Population

According to Best(2010), a population is defined as any group of individuals who have one or more characteristics in common that are of interest to the researcher. According to the population and household (census, 2012), Magharibi “A” District occupied with total population of 163,740.Most of the population live in 16 villages or called Shehia all around the District. The target population of this study is the farmers growing horticultural crops located in the sixteen purposely selected Shehia of Magharibi “A” District of Zanzibar which are Kihinani, Kibweni, SharifuMsa, MtoniKidatu, Bumbwisudi, Mbuzini, Kizimbani, Dole, Kianga, Mwakaje, Mfenesini, Kama, Chuini, Mtoni and Mwera. The Shehia are selecteddue to their potential for agriculture particularly horticultural activities.

3.6 Sampling Design and Procedures

The study used simple random sampling technique to enable each participant to have

an equal chance of being chosen. Since studying the entire population is either impossible or impractical, so the researcher decided to use simple random sampling procedures to gather data from a representative portion of the population. The selected sample ideally reflected the characteristics of the larger population, allowing researchers to draw accurate and meaningful conclusions.

3.7 Sample Size

This quantitative study used Yamane (1967) formula to obtain sample size. The formula is as follow:

$$\mathbf{n=N/\ (1+Ne^2)}$$

Here:

n=Sample size,

N = population

e = error tolerance or point of confidence (e = level of precision (0.05)

1 = Unit (constant)

Therefore: $n = 280/1+280(0.05)^2$

$n = 164.7 \approx 165$ (Rounded up).

In this study the sampling frame was 280 smallholder farmers who are vegetable growers in Magharibi "A",(District Annual Agricultural Report, 2020).

3.8 Variables and Measurement Procedures

This study comprised of independent variables (IVs) including perceived usefulness, ease of use, farmer's attitude and social influence and the dependent variable (DV) namely intention to use drip irrigation technology. The scale items from previous

studies were used to measure the IVs and the DV as indicated in Table 3.1. However, the scale items were modified to suit the current study.

Table 3.1.1: Variables and Measurements

S/N	Variable to be measured	Number of scale items	Source
1	Perceived usefulness	6	Moakofhi, Phiri, Leteane & Bangomwa(2019), Rigopoulos, Psarras & Askounis (2008)
2	Perceived ease of use	7	Moakofhi, Phiri, Leteane & Bangomwa (2019), Rigopoulos, Psarras & Askounis (2008)
3	Attitudes towards use	7	Moakofhi, Phiri, Leteane & Bangomwa (2019)
4	Social influence	6	LamasLoizid, Nacke, Petrie, Winckler & Zaphiris (2019), Sánchez-Alzate, A. & Sánchez-Torres (2017)
5	Intention to use drip irrigation	5	Valizadeh, Rezaei-Moghaddam & Hayati (2020)

Source: Field Data, (2022)

3.9 Methods of Data Collection

This study used questionnaires to collect data. The questions was Likert like scale with responses ranging from 1 = strongly disagree to 5 = strongly agree. The researcher administered the questionnaire.

3.10 Reliability and Validity

3.10.1 Reliability

Valizadeh, Rezaei-Moghaddam, &Hayati (2020) defined reliability as the degree to which research method produces stable and consistent results.In order to maintain study reliability the study will use Cronbach's Coefficient Alpha. Cronbach's alpha is a measure of internal consistency, that is, how closely related a set of items are as a group as it is considered to be a measure of scale reliability. The recommended cut off point value is 0.7 and above (Hair, Celsi, Money, Samoul& Page, 2016).

3.10.2 Validity of Data

Validity refers to how accurately a method measures what it is intended to measure. If research has high validity that means it produces results that correspond to real properties, characteristics, and variations in the physical or social world. In order to maintain validity of this study, questionnaire was shared with various researchers for advice and corrections hence maintain the consistence of questionnaires and at lastly was pre-tested accordingly prior to actual data collection exercise.

3.11 Data Processing and Analysis

3.11.1 Data Processing

Linearity for not curvilinear relationship between independent variables and dependent variable was tested by scatter plots and normality distribution was checked by Q-Q plot. Multicolinearity was tested by the application of correlation coefficients and or Variable Inflation Factor (VIF). Autocorrelation was checked by using scatter plots and tested with Durbin-Watson test. Homoscedasticity was tested by scatter plot. In this study outliers was detected by case wise diagnostic.

3.11.2 Data Analysis

The data was analyzed using the statistical package for social sciences (SPSS) software version 22 where descriptive and inferential analysis was done. Multiple regression analysis was used for inferential data analysis.

Multiple linear regressions model was used was:

$$\mathbf{Y = a+b_1X_1 + b_2X_2+ b_3X_3 + b_4X_4 +£}$$

Whereby:

X_1, X_2, X_3 and X_4 are four independent variables (Perceived usefulness,

Perceived ease of use, farmer's attitude and social influence)

X_1= Perceived usefulness

X_2= Perceived ease of use

X_3= Farmer's attitude

X_4= Social influence

Y = Dependent variable (Intention to use drip irrigation)

a =Constant

b_1= Regression coefficient of variable X_1

b_2 = Regression coefficient of variable X_2

b_3= Regression coefficient of variable X_3

b_4= Regression coefficient of variable X_4

£ = error term

3.12 Ethical Consideration

Research ethics was strictly observed and planned in conducting the study. The researcher sought a research clearance letter from the directorate of postgraduate studies of The Open University of Tanzania. Thereafter, the researcher sent the letter to Magharibi "A" District of Zanzibar to also get the permission to collect data from the study area. Issues of confidentiality and anonymity were part of this study. Anonymity was observed and the researcher sought their consent and participants were free to leave at any stage of data collection.

CHAPTER FOUR

FINDINGS

4.1 Introduction

This chapter presents the findings of the study. It includes the demographic characteristics of the respondents and findings of the four specific research objectives.

4.2 Demographic Information of the Respondents

Dealing with demographic information of the respondents is very important because it enable the researcher to get detailed information about respondent's demographic profile. In demographic information the researcher set personal characteristics of the respondents such as age, gender, marital status, and experience in using drip irrigation, education level, extension service and access to finance.

4.2.1 Age of the Respondents

Age distribution of the respondents was used as an important aspect in analyzing which age group mostly available in vegetable growing. The respondent age distribution reveal that 20-30 years were 51(30.9%), 31-40 years 34(20.6%), 41 – 50years 28(17.6%) and above 51 years were 52(31.5%). This findings suggest that majority of the horticultural growers were above 51years of age. Isaac (2020)found that older farmers were conspicuously present and contributed during the farming activities and also insisted that older farmers with long years of experience adopted innovation better than the younger one. According to Girma (2017) young farmers are less likely to use drip irrigation practices continuously. Figure 4.1 shows the age distribution of the respondents.

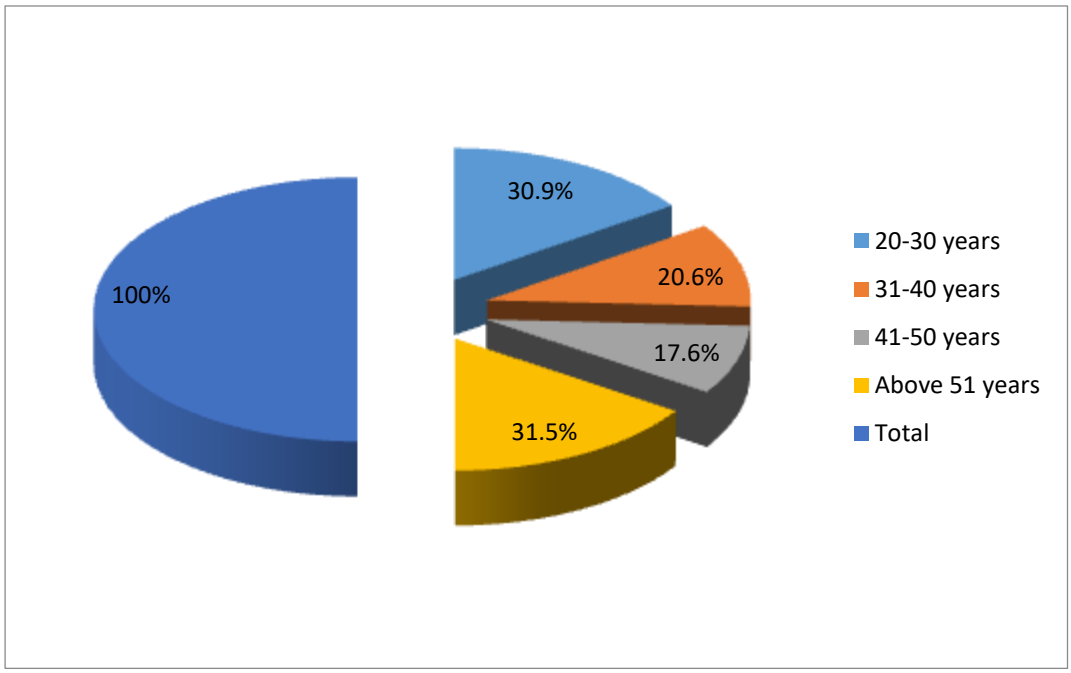


Figure 4.1: Age Distribution of the Study Respondents

Source: Field Data, 2022

4.2.2 Gender of Respondent

Figure 4.2 shows the distribution of gender of the study respondents.

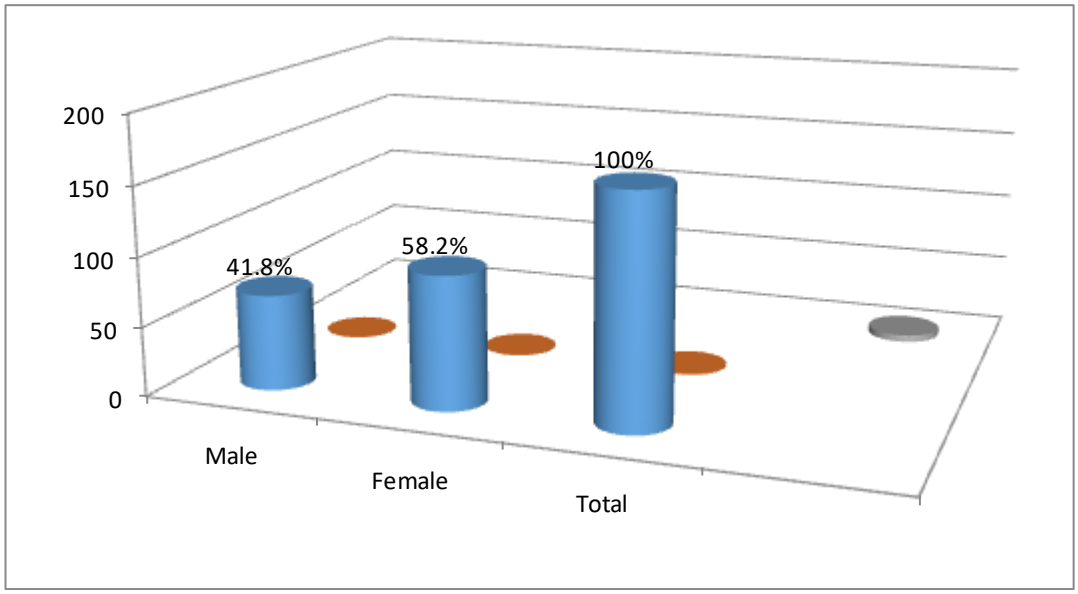


Figure 4.2: Gender of the Study Respondents

Source: Field Data, (2022).

The study conducted also involved both male and female smallholder farmers in order to find out their composition of the respondents in regard to their gender. The result indicated that majority of the respondents 96(58.2%) were females while the males were 69(41.8%). This means both males and females are involved in horticultural farming though majority are females.

4.2.3 Marital Status of the Study Respondents

Results from Figure 4.3 show that out 165 respondents, 70 (42.4%) were married, while 79(47.9 %) were single, 11(6.7%) were widowed and the remaining 5(3%) were separated. These results suggest that most of vegetable growers were either separated or divorced.

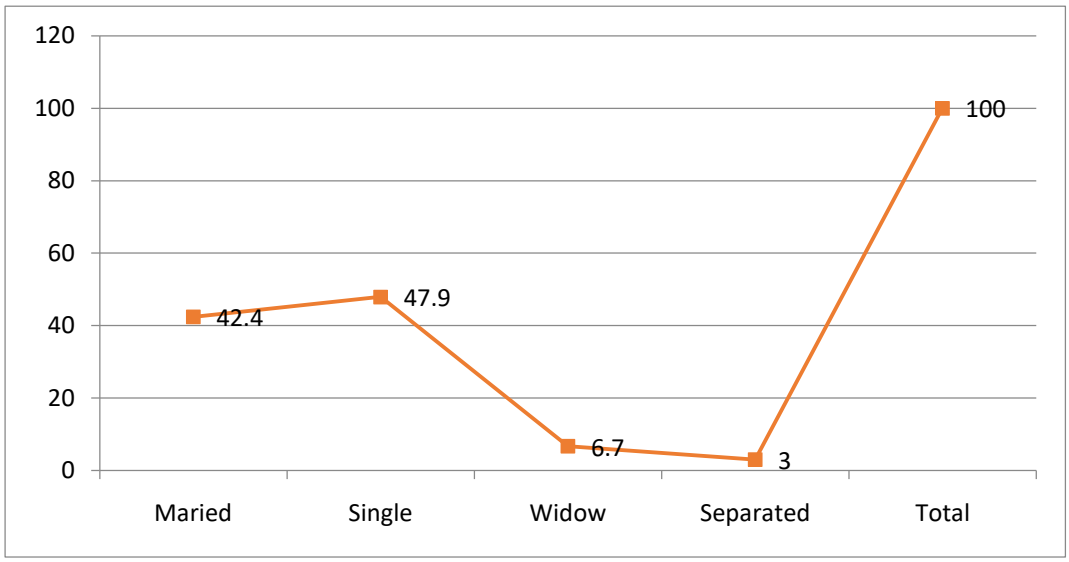


Figure 4.3: Marital Status of the Study Respondents

Source: Field Data 2022

4.2.4 Experience in using Drip Irrigation

Regarding to working experience the study showed that majority 102(61.8%) have an experience of less than five years in using drip irrigation followed by 56(33.9%)

who have 5-10 years of experience. Those who have 10-20years were 6(3.6%) while those who have 21-30 years were only one. This indicates that majority have less experience in using drip irrigation. The bar chart shows the experience of using drip irrigation.

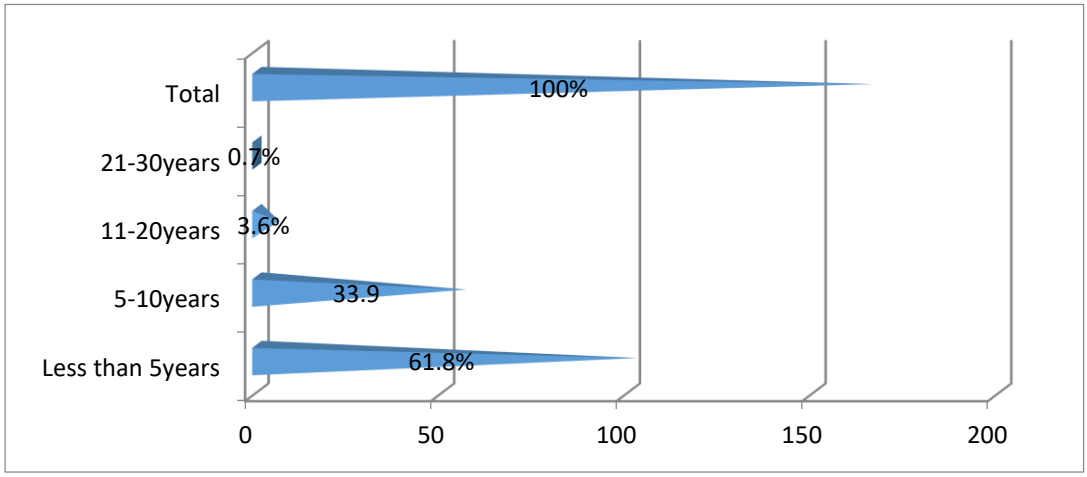


Figure 4.4: Experience of using Drip Irrigation

Source: Field Data (2022).

4.2.5 Level of Education

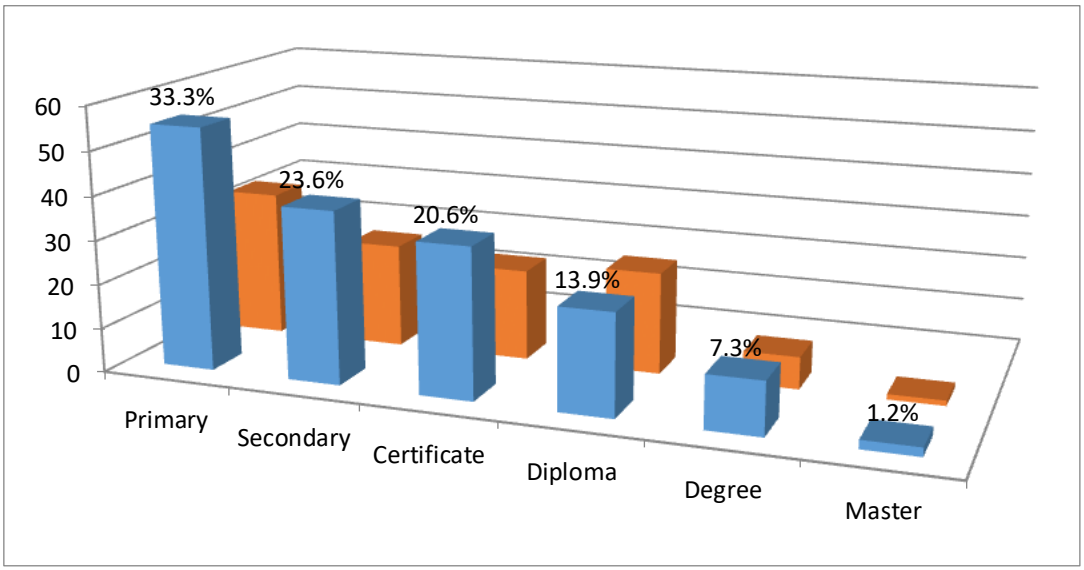


Figure 4.5: Level of education of the Respondents

Source: Field Data (2022).

Figure 4.5 indicates that the majority 55(33.3%) of respondents had primary level education followed by 34(20.6%) who have secondary education. The least proportion 2(1.2%) headmaster degree. This means that the majority of smallholder farmers had low level of education.

4.2.6 Extension Service

Pertaining to the extension service among smallholder farmers, the result indicated that majority of research participants 129 (78.2%) did not receive the extension service required for the proper utilization of modern drip irrigation system while only minor proportion 36 (21.8%) received extension services. This finding implies that extension services are not sufficient. The Figure 4.6 summarizes the findings.

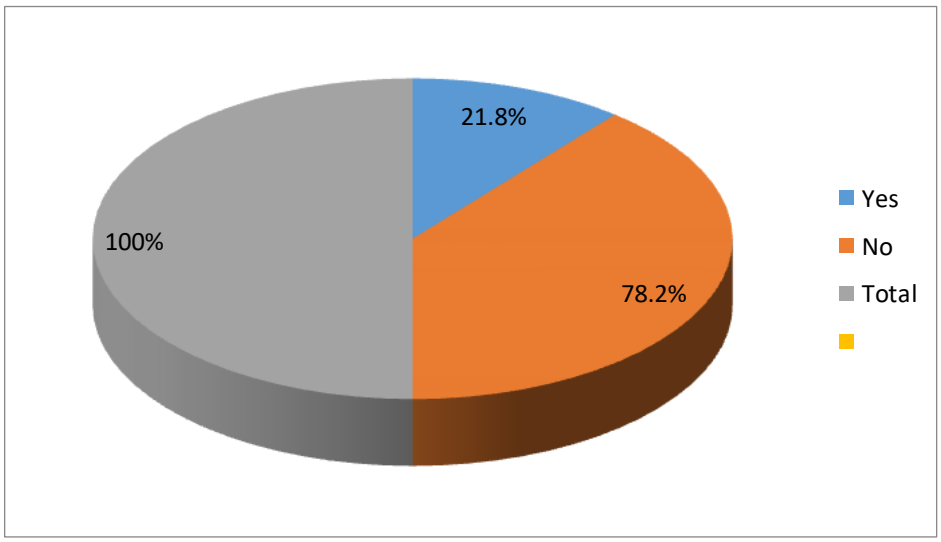


Figure 4.5: Extension Service for Drip Irrigation

Source: Field Data (2022).

4.2.7 Access to Finance

Figure 4.7 shows access to finance by smallholder farmers. It reveals that majority of respondents 132(80.0%) do not receive any financial assistance from any source of

finance while only 33(20.0%) received financial assistance. This indicates that access to finance is very limited among the smallholder farmers.

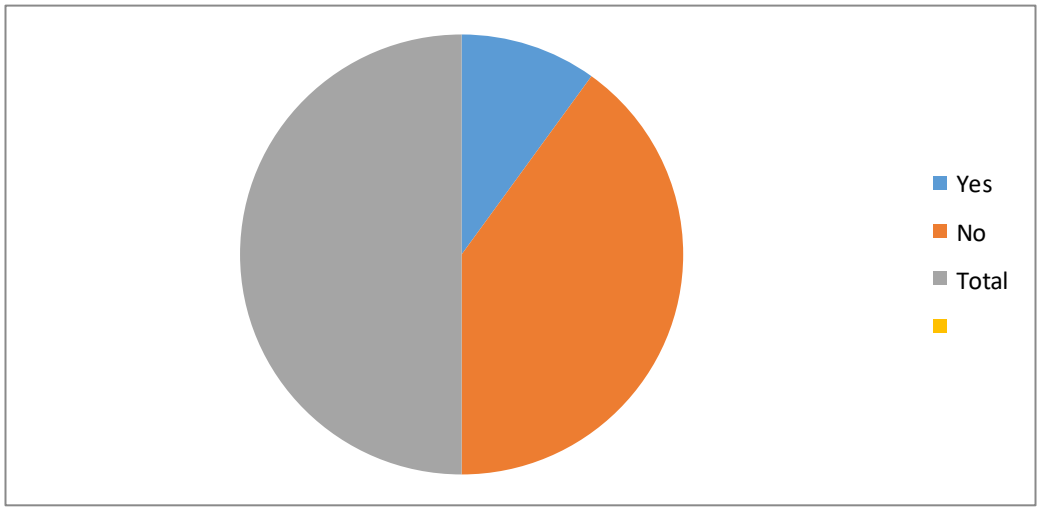


Figure 4.7: Access to Finance

Source: Field Data (2022).

4.2.8 Respondent's Responses on Studied Variables

4.2.8.1 Influence of Perceived Usefulness

The influence of perceived usefulness is the degree which a smallholder farmer believes that using particular information about drip irrigation system would enhance his/her farming performance. It is also believed that a system high in perceived usefulness is the one that a user believes that it has a positive usage to performance relation. In this study the variable perceived usefulness is related to various question to see whether it influence the farmer to use the modern drip irrigation technology or not.

The question on whether using drip irrigation would enable smallholder farmer to accomplish task more quickly was asked to all study respondents. Majority 61.8% strong agreed that using modern drip irrigation is very useful and would enable them

to accomplish farming tasks more quickly compared to37.0% who agreed that it is useful. Only 1.2% who disagreed. This means that most of the respondents perceived that using modern drip irrigation system is very useful for farming. The question of whether using drip irrigation would improve productivity was very important in the study. Most 63.0% of the respondents strongly agreed that it enhance productivity and the remaining proportion 37.0% who agreed. In generally, the findings showed that all study respondents perceived that drip irrigation is useful and improve productivity.

The analysis on using drip irrigation whether would improve farmers performance was included in the study. The result showed that majority 66.1% strong agreed while the remaining 33.9% agreed. This indicated that using drip irrigation always improve their performance in farming. The study also examined drip irrigation is useful on their job hence showed that 63.6% strong agreed while the remaining 36.4% agreed. This means that most of the respondents believe that using modern drip irrigation is useful their job. Moreover, 66.7% of the study respondents strongly agreed while 33.3% agreed that using drip irrigation would make it easier in doing their job. So it indicated that modern drip irrigation is easier technology during the implementation of the farming.

At last the study considered the use of drip irrigation as whether it enhances the effectiveness and efficiency of smallholder farmers during their farming. The result show that majority 63.0% of respondents strong agreed followed by 36.4% agreed and the remaining proportion 6% who remain not sure. Therefore this means that nearly all respondents believe that using modern drip irrigation enhance the

effectiveness and efficiency in farming. These findings are illustrated in the below Table 4.1.

Table 4.1: Influence of perceived usefulness (N=165)

Variables	Strongly Disagree		Disagree		Not Sure		Agree		Strongly Agree	
	F	%	F	%	F	%	F	%	F	%
Using drip irrigation enable to accomplish task more quickly			2	1.2			61	37.0	108	61.8
Using drip irrigation improve productivity							61	37.0	104	63.0
Using drip irrigation improve performance							56	33.9	109	66.1
I would find the drip irrigation useful in my job							60	36.4	105	63.6
Using drip irrigation would make easier to do my job							55	33.3	110	66.7
Using drip irrigation enhance my effectiveness and efficiency on my job					1	6	60	36.4	104	63.0

Source: Field Data, (2022).

4.2.8.1 Measure of Perceived ease of Use

The study aimed in identifying different measures of perceived ease of use and to see how it influences the use of modern drip irrigation among smallholder farmers. The descriptive statistic of the findings of the variable learning to operate drip irrigation is ease for the farmers revealed that 58.8% strong agreed, 40.0% agreed followed by 1.2% they said were not sure. This implies that the greater percentage agreed that to operate drip irrigation system would be ease for them. Also the researcher asks the respondents if they would find it easy to get the system to do what they want to do.

The answers from the respondents showed that majority 55.8% strong agreed, 43.6% agreed while the remaining 0.6% was not sure whether it would be ease to get the system to do what they want to do. Generally, it implies that most of the respondents

agreed that it would be ease to get the system to do they want to do to their farming. On issue of interaction with drip irrigation system, they saw that majority 55.8% strong agreed, 43.6% agreed while the rest 0.6% were not sure. This gives a clear picture that farmer's interaction with drip irrigation system is clear and understandable. Study respondents were asked whether drip irrigation system is flexible to interact or not.

Table 4.2: Measure of Perceived ease of Use

Variables	Strongly Disagree		Disagree		Not Sure		Agree		Strongly Agree	
	F	%	F	%	F	%	F	%	F	%
Learning to operate drip irrigation would be easy for me					2	1.2	66	40.0	97	58.8
I would find it easy to get the system to do what I want it to do					1	0.6	72	43.6	92	55.8
My interaction with drip irrigation system would be clear and understandable					1	0.6	72	43.6	92	55.8
I would find drip irrigation to be flexible to interact with					1	0.6	71	43.0	93	56.4
It would be easy for me to became skillful at using drip irrigation					1	0.6	72	43.6	92	55.8
I would find drip irrigation system easy to use							73	44.2	92	55.8
I would find drip irrigation easy to install	28	17.0	93	56.4	26	15.4	8	4.8	10	6.1

Source: Field Data, (2022)

Finding from the Table 4.2 shows that many 56.4% were strong agreed, 43.0% agreed while 0.6% was not sure. This implies that drip irrigation system is among the small holder farmers. In gaining skills on using drip irrigation system, the study

found that most 55.8% strong agreed, 43.6% agreed while the rest 0.6% were not sure. This signifies that acquiring skills is easy among smallholder farmers. When smallholder farmers were asked to rank whether drip irrigation system is easy to use in their farming 55.8% ranked strong agree while 44.2%.The result from respondents showed that most of them believed the drip irrigation system is easy to use during their farming. In order to determine the installation the drip irrigation system how easy to install drip irrigation system, the study found that majority 56.4% said that installation of the drip irrigation is not easy while the remaining 6.1% agreed.

4.2.8.3 Measures of Social Influences

Social influence involves an intentional effort to change one persons believe attitudes and behavior. In this study the researcher wish to measure how social influence enhance the use of drip irrigation system among the smallholder farmers. On achieving this respondents were asked to rank whether friends would motivate farmers to use drip irrigation system. Referring to the table below majority 49.7% of the respondent ranked strong agrees that friends would motivate them to use drip irrigation system, 48.5% agree, 1.2% not sure while 0.6% disagree. The question of whether individuals whom a farmer regard important would support them use drip irrigation was posed to all study respondents.

The analysis showed that 55.8% strongly agreed that individual whom they regard important would support them to drip irrigation system. Others 43.0% agreed followed by 0.6% not sure while 0.6% disagrees. The result suggest that smallholder farmers important individual that smallholder farmers close relatives are very important components to influence them on using drip irrigation system. On whether

smallholder farmers can buy drip irrigation system if commended by family members, most 54.5% of respondents strongly agreed that they can buy the system if they social influenced or commended by member of the family. Farmers which falls under agree were 43.0%, 1.2% were not sure and minority 1.2% were disagreed which indicated that buying the system is not necessarily influenced or commended by family member. The researcher wish to understand if positive responses from friends and family toward drip irrigation increase farmer's motivation to use it.

Table 4.3: Measures of Social Influences

Variables	Strongly Disagree		Disagree		Not Sure		Agree		Strongly Agree	
	F	%	F	%	F	%	F	%	F	%
My friends would motivate me to use drip irrigation			1	0.6	2	1.2	80	48.5	82	49.7
Individuals whom I regard important would support me to use drip irrigation			1	0.6	1	0.6	71	43.0	92	55.8
I would buy drip irrigation if commended by a member of my family			2	1.2	2	1.2	71	43.0	90	54.5
Positive responses from friends and family towards drip irrigation increase my motivation to use it.	1	0.6					71	43.0	93	56.4
I am concerned with others comments regarding drip irrigation							77	46.7	88	53.3
When I see people using drip irrigation, I want to do as well							75	45.5	90	54.5

Source: Field Data, (2022).

The findings of the study revealed that the majority 56.4% strong agree followed by agree 43.0% and the remaining 0.6% strong disagree. This exhibit that friends and family have positive response to motivate farmers toward the use of drip irrigation system. Regarding other comments about drip irrigation use, most of the respondents

53.3% strong agreed while the remaining 46.7% agreed. This show that almost all the respondents are concerned with others people comments regarding drip irrigation use. Majority 54.5% of the study respondents indicated by strong agrees on the likert scale and the remaining 45.5 showed they agreed that when they farmers using drip irrigation they want to do it as well.

4.2.8.4 Measure of Attitudes toward use of Drip Irrigation

The study wishes to measure attitudes of smallholder farmers toward the use of drip irrigation as attitude remains an essential input in drip irrigation and for crops and vegetable production. The table below shows that majority 57.6% strong agree while the remaining 42.4% agreed. This means that most of the smallholder farmers when they using drip irrigation system noticed that it is better than using rain fed farming system. The second aspect investigated is whether farmers would like to use drip irrigation system more frequently in their farming activities.

The result of this investigation indicated that majority 58.8% and 40.6% agreed that they would like to use drip irrigation system more in farming activities, contrary 0.6% to those who were not sure. Also the study suggested that all respondents believe that using drip irrigation system would improve their work in farming which is 61.2% and 38.8%. Nearly 63.0% of the respondents strong agreed that drip irrigation system is an effective technology for saving irrigation water while 37.0% agreed on the matter investigated.

Generally, the finding indicated that the system is an effective technology for saving irrigation water in farming. Considering statement of whether farming with drip

irrigation system is exciting the result showed that majority 65.5% strong agreed while the rest 34.5% agreed. This indicates that all respondents believed that it is exciting to them.

Table 4.4: Measure of Attitudes toward use of Drip Irrigation

Variables	Strongly Disagree		Disagree		Not Sure		Agree		Strongly Agree	
	F	%	F	%	F	%	F	%	F	%
I think that using drip irrigation system is better than rain fed farming							70	42.4	95	57.6
I would like to use drip irrigation system more in my farming activities					1	0.6	67	40.6	97	58.8
I believe using drip irrigation system would improve my work							64	38.8	101	61.2
I think drip irrigation system is an effective technology for saving irrigation water							61	37.0	104	63.0
Farming with drip irrigation system is exciting							57	34.5	108	65.5
My attitude towards using drip irrigation system make me intend to use it							56	33.9	109	66.1
My attitude towards using drip irrigation system make me accept to use it							56	33.9	109	66.1

Source: Field Data, (2022).

The question of farmer's attitude toward using drip irrigation system makes them intend to use it was posed to all study respondents. The analysis of this question indicates that majority 66.1% strong agreed while the remaining 33.9% agreed. This shows that there is positive attitude of the farmers toward the intention of using drip irrigation system. Finally, attitude of smallholder farmers on accepting the use of drip irrigation system was investigated. The responds were divided into strong agree 66.1% and agree 33.9%. This means that all study respondents 100% have positive attitude and accept the use of drip irrigation system in their farming.

4.3 Multiple Regression Assumptions

4.3.1 Normality Assumptions

The Q-Q plot was used to test normality assumption. Figures 4.8 to 4.9 indicated that the data were approximately normally distributed.

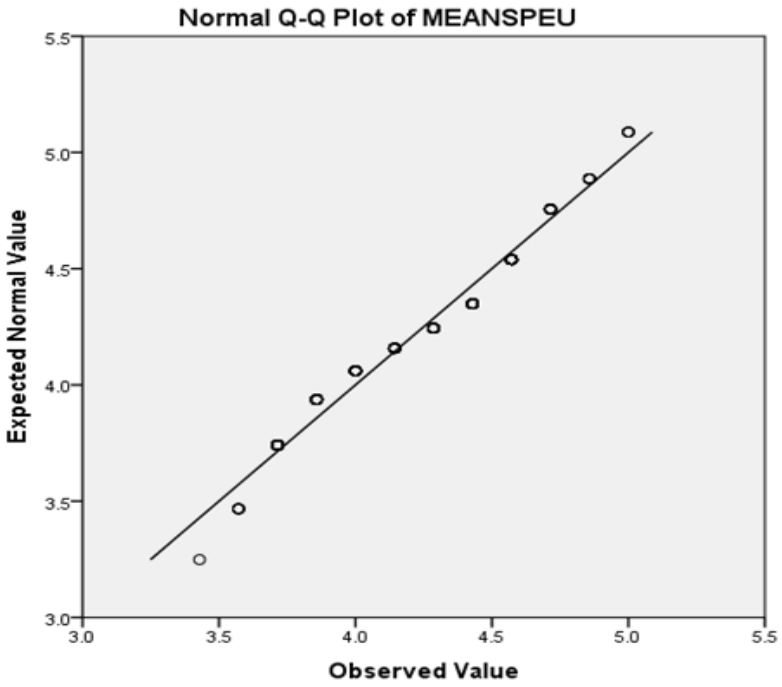


Figure 4.8: Q-Q Plot for Perceived Ease of Use

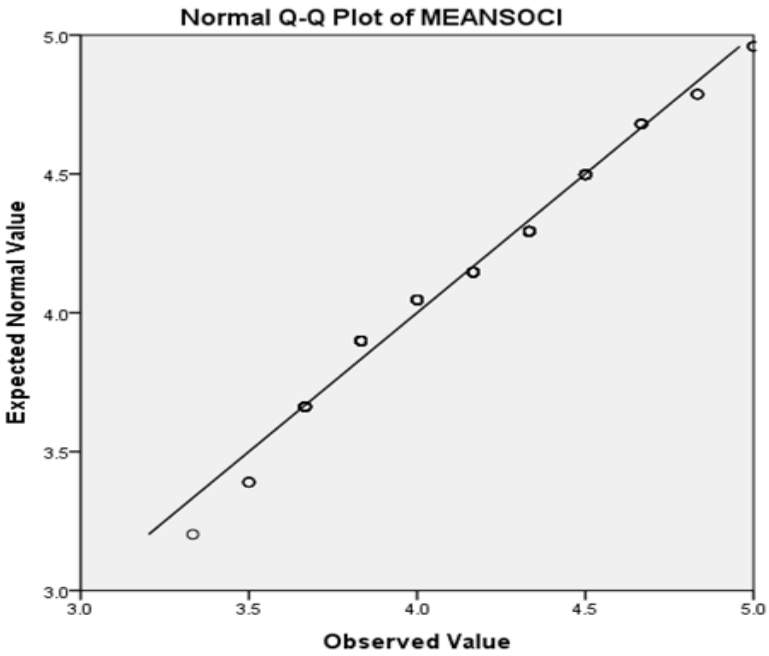


Figure 4.9: Plot for Social Influence

The Q-Q plot is provides a visual assessment of normality. From the plots, since the data points closely follow a straight line at a 45-degree angle from the bottom-left to the top-right of the plot, it suggests that the data is approximately normally distributed. Deviations from the straight line indicate departures from normality (non-normality) which can affect the validity of the results and the interpretation of statistical tests.

4.3.2 Assumption of Homoscedasticity

This assumption was tested using Pallant (2011) recommendation. The author pointed out that homoscedasticity assumes identical variance of errors layout between independent variables, that no residuals are distributed uniformly along the line. The results indicate that the distribution of residual values is uniformly distributed. There are no clusters and hence the Homoscedasticity assumption is attained.

In the context of a scatter plot in linear regression, if the points are not concentrated" refers to the dispersion or spread of data points around the regression line. With reference to figure 4.10 to 4.13, a dependent variable (Y) and an independent variable (X), represents the relationship between these variables. Since the points are concentrated and closely clustered around the regression line, it suggests a stronger relationship between the variables, and the linear regression model is likely to provide a better fit to the data.

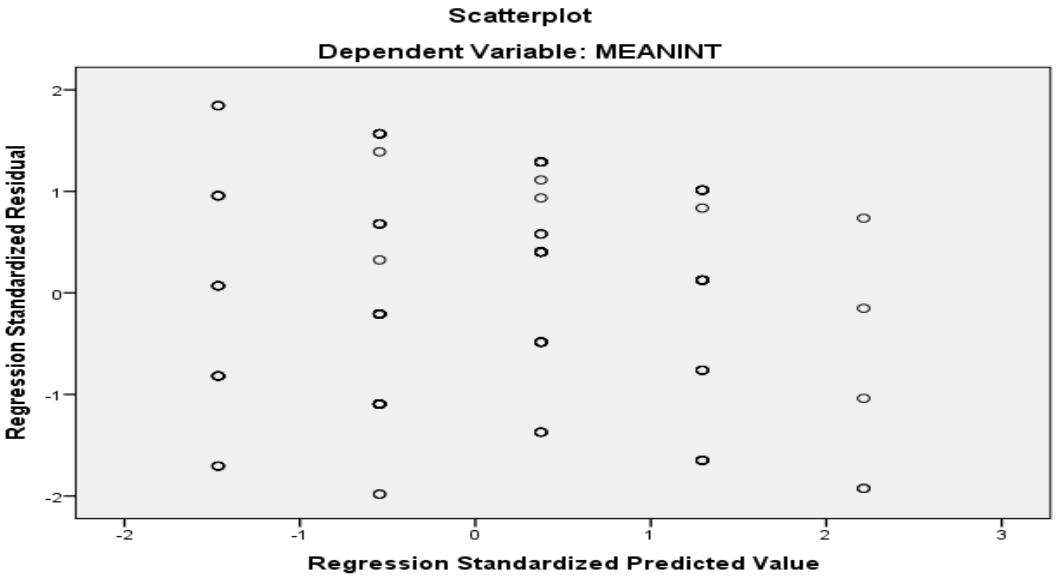


Figure 4.10: Scatter Plot for Perceived Ease of Use

The scatter plot is a visual representation of the data, and the degree of concentration or dispersion of points can provide valuable insights into the strength and nature of the relationship between the variables being analyzed. In summary, "points not concentrated" in a linear regression scatter plot imply greater variability and a weaker relationship between the variables.

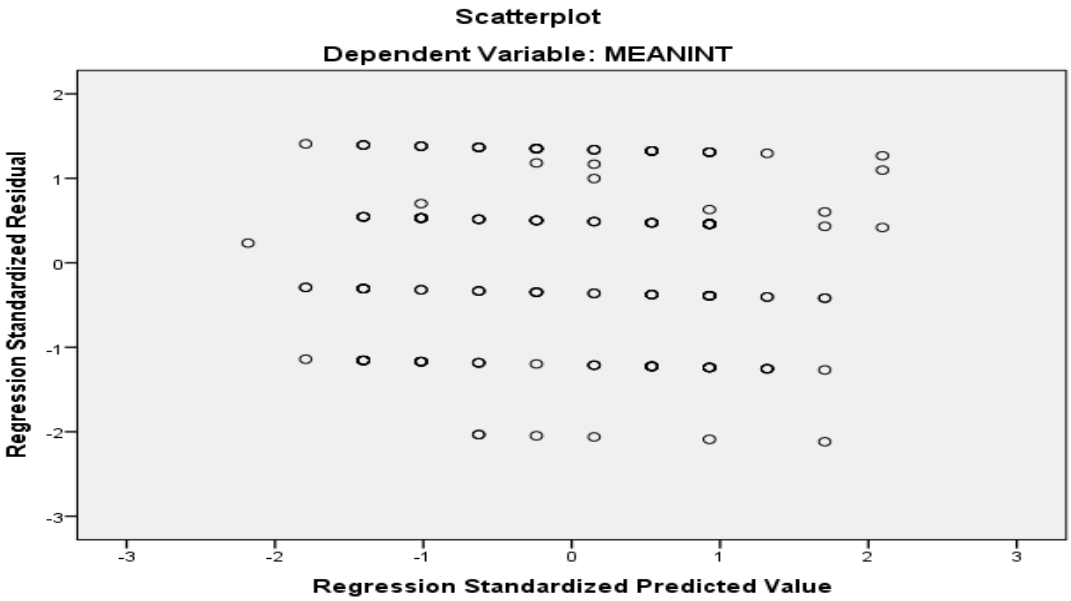


Figure 4.11: Scatter Plot for Attitudes towards use of Drip Irrigation

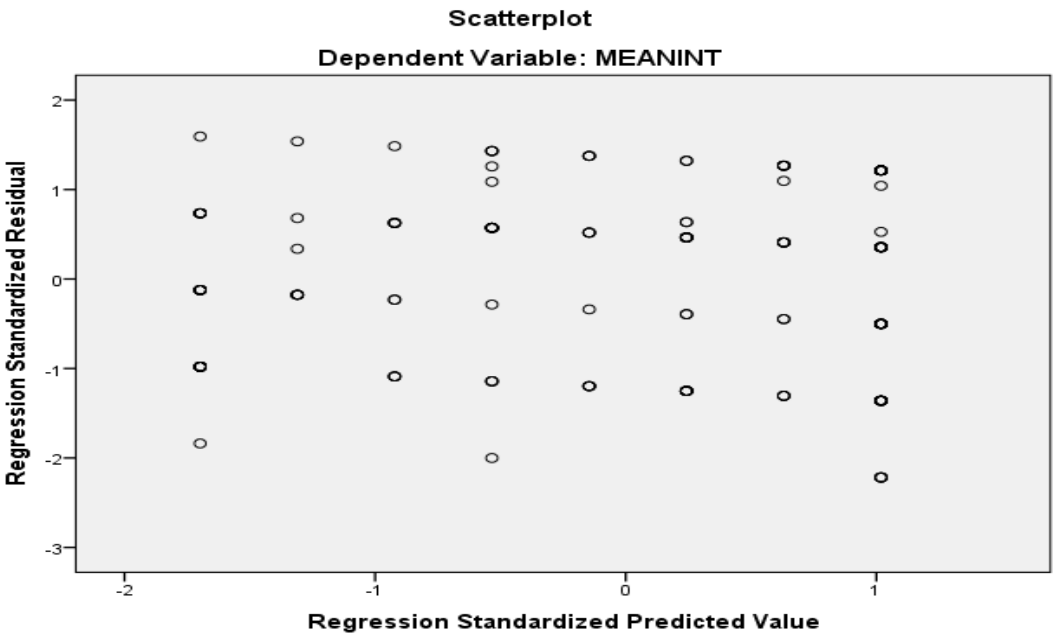


Figure 4.12: Scatter Plot for Social Influence

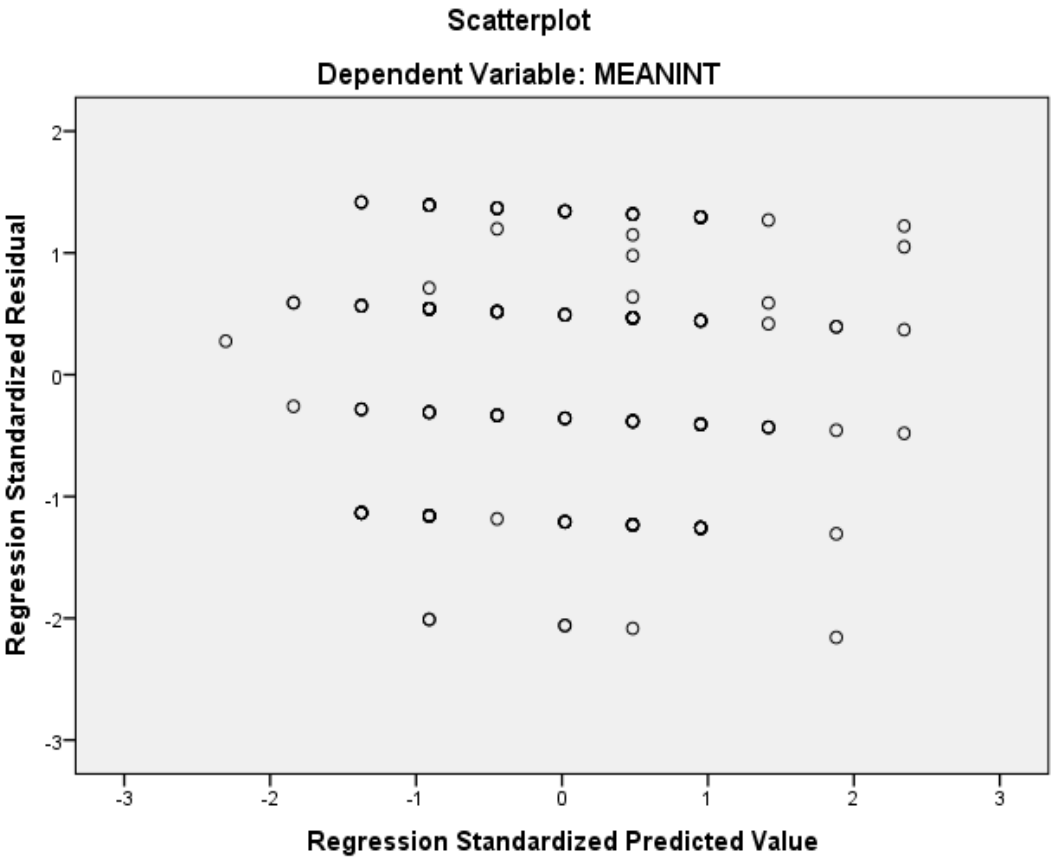


Figure 4.13: Scatter Plot for Perceived usefulness

4.3.3 Multicollinearity Assumption

Variance Inflated Factor (VIF) and Tolerance values were applied to test presence of multicollinearity problem. VIF values greater than 5 and Tolerance values less than 0.2 indicate the presence of multicollinearity (Hair, Celsi, Money, Samoul & Page, 2016).Table 4.1:4 reveals that there was no multicollinearity problem in the current study as the tolerance and VIF values did not exceed the threshold values.

4.3.4 Autocorrelation Assumption

The current study used Durbin-Watson to test the autocorrelation assumption. Field (2009) argue that Durbin-Watson value of 1.5 - 2.5 is recommended for absence of autocorrelation problem. The Durbin-Watson statistic is a measure used in regression analysis to detect the presence of autocorrelation in the residuals of a regression model. The results from the study indicate that the Durbin-Watson value was 1.910 which meets the recommended cut-off point. Since $0 < DW < 2$ represent positive autocorrelation, From Table 4.6 a reading approximate to 2 indicating that the residuals are not auto correlated with each other. This is the ideal case in linear regression.

4.4 Reliability Test

Table 4.5 presents the results of the reliability test. It indicates the Cronbach's Coefficient Alpha values ranged from 0.768 to 0.930.

Table 4.5: Reliability Test

Variable tested	No of the items used	Cronbach's Alpha
Perceived Usefulness	6	.930
Perceived ease of use	6	. 846
Measures of social influence	6	.864
Attitudes towards use of drip irrigation	7	.876
Intention to use drip irrigation	5	.768

Source: Field Data, (2022).

In this test, the researcher's aim was to test a balance between high internal consistency and the number of items in the scale to ensure reliable measurement. Cronbach's alpha value between 0.80 and 0.90 represents very good internal consistency or reliability. The scale shows a high level of consistency among its items, indicating that it is a reliable measurement instrument for the underlying construct. Hence the internal consistence of the research instrument was attained.

4.5 Model Summary

Table 4.6: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.565[a]	.319	.302	.36581	.319	18.761	4	160	.000	1.910

a. Predictors: (Constant), Social influence, , Attitude, Perceived usefulness, Perceived ease of use
b. Dependent Variable: Intention to use drip irrigation

Table 4.6 reveals the model summary results. It shows that, out of 32% of the variations in the intention to use drip irrigation are due to the impact of perceived ease of use, perceived usefulness, social influence and attitudes towards use of drip irrigation. The remaining 68% is explained by other variables not included in the model.

4.6 ANOVA

Table 4.7 indicates the ANOVA results were positive and significant. This suggests that the regression model utilized was suitable for data. Hence, the independent variables were positive predictors of the dependent variable.

Table 4.7: ANOVA

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	10.042	4	2.511	18.761	.000[b]
	Residual	21.411	160	.134		
	Total	31.453	164			

a. Dependent Variable: Intention to use drip irrigation

b. Predictors: (Constant), Social influence, , Attitude, Perceived usefulness, Perceived ease of use

4.6 Coefficients

The dependent variable (intention to use drip irrigation) was regressed on for independent variables namely perceived usefulness, perceived ease of use, farmer's attitude and social influence. The regression results gave a multiple correlation (R) of 0.565. This means that the independent variables which were used in the regression model, collectively, were strongly associated with the dependent variable.

The regression results (Table 4.7) reveals that perceived usefulness has positive and significant effect on the intention to use drip irrigation and statistically significant at p-value = 0.000 and β= 0.345, implying that the more the smallholder farmers perceive that drip irrigation is useful to them, the higher the rate of technology adoption. Hence, hypothesis H_1which stated that perceived usefulness has positive and significant influence on intention to use drip irrigation was accepted.

Similarly, the result show that perceived ease of use has positive and significant effect on the intention to use drip irrigation (β= 1.345, t = 6.076, P = 0.000). This implies that perceived ease of use has positive drip irrigation usage. In other words, the higher the perceived ease of use, the higher the desire to use drip irrigation. Thus, hypothesis H_2 which stated that perceived ease of use has positive and significant influence on intention to use drip irrigation was supposed.

Table 4.8: Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.827	.548		1.509	.133		
	Perceived Usefulness	.345	.077	.336	4.494	.000	.761	1.314
	Perceived ease of use	1.345	.221	1.129	6.076	.000	.123	8.112
	Attitudes towards use of drip irrigation	.428	.078	.360	5.503	.000	.995	1.006
	Social influence	1.399	.216	1.145	6.476	.000	.136	7.352

a. Dependent Variable: Intension to use drip irrigation

On the other hand, Table 4.8 indicates that attitudes towards use of drip irrigation has a positive and significant effect on the intention to use drip irrigation (β= 0.827, t = 1.509, P = 0.133). When the p-value is significant ($p \leq \alpha$), it suggests that the corresponding independent variable has a statistically significant impact on the dependent variable in the model. This implies that farmer's attitudes towards drip irrigation influence the intention to use drip irrigation. Therefore, hypothesis H_3 which stated that attitudes towards use of drip irrigation have positive and significant influence on intention to use drip irrigation was supported.

Moreover, Table 4.8 reveals that, social influence has positive and significant influence on the intention to use drip irrigation by farmers (β= 1.399, t = 6.476, P = 0.000). This suggests that social influence plays a big role in building the intention of smallholder farmers to use drip irrigation. Thus, hypothesis H_4 which postulates that social influence has positive and significant influence on intention to use drip irrigation was accepted.

4.6.1 Summary of Hypotheses Testing

Table 4.9 summarizes the findings of hypotheses testing. It reveals that all hypotheses were accepted. If all the hypothesis tests agree with the assumptions, it means that the statistical analysis conducted on the data has provided consistent and reliable results. Meeting the assumptions allows for clearer and more straightforward interpretations of the results. This brings a trust that the effects observed in the data are likely due to the factors being tested, rather than potential biases caused by violation of assumptions.

Table 4.9: Hypotheses Test Findings

Hypotheses tested	**Remarks**
H1: Perceived usefulness has positive and significant influence on intention to use drip irrigation	Accepted
H_2: Perceived ease of use has positive and significant influence on intention to use drip irrigation	Accepted
H3: Attitudes towards use has positive and significant influence on intention to use drip irrigation	Accepted
H4: Social influence has positive and significant influence on intention to use drip irrigation	Accepted

CHAPTER FIVE

DISCUSSION OF FINDING

5.1 Overview

This chapter presents the main discussion of the findings. This part also includes the analysis of various studies globally to show how they relate, confirm or differ from the finding of this study.

5.2 The influence of Perceived Usefulness on Intention to use Drip Irrigation Technology

The current study determined the influence of perceived usefulness on the intention to use drip irrigation among horticultural crop growers based on technology acceptance model (TAM). The present study compared the theoretical and empirical literature regarding the influence of perceived usefulness, on the intention to adopt modern drip irrigation technology. The results reveal that, perceived usefulness positively and significantly impacts the intention to use drip irrigation. This means that the more smallholder farmers perceived that drip irrigation is useful the more they tended to use the technology. These results are in lined with the study by Abdelrouf, L-Shawadf, Ghoname and Ragab (2020) in which famers pointed out that using drip irrigation is more useful as it increases potato yield for farmers.

Similarly, Canvari, Medici, Wongprawmas, Xhakollari and Russo (2021), found that smallholder farmers who perceived drip irrigation technology as being useful to use tend to adopt and use it. On other hand, Haji, Valizadeh, Rezaei-Moghaddam and Hayati (2020) found that perceived usefulness is the second most powerful variable affecting farmer's behavioral intention toward the acceptance of drip irrigation. It

can be inferred that the more smallholder farmers understand the benefits of modern drip irrigation, the more they intend to use the technology. In this regards agriculture expertise specialized in drip irrigation should increase smallholder awareness about the usefulness of the modern drip irrigation technology. The findings of this study are also supported by the study of Verma, Chandel and Sharma (2020) found that drip irrigation technology increases physiological growth, yield, quality, water use efficiency and saved water use in fruits crops as compared to conventional method of irrigation.

Another study by Montazar, Cahn and Putman (2019) also found that drip irrigation is useful as it give a chance to produce organic spinach, conserve water and hence the efficiency of water use and reduce incidence of down mildew. The study further explained that drip irrigation system is very effective and efficient to maintain productivity and economic viability of spinach production in California. Therefore improving drip irrigation efficiency aims at minimizing water use and continuing to maintain optimal crop productivity rate. It is also efficient in providing a number of environmental and social economic benefits among the smallholder farmers.

Anbari, et al., (2013) found that farmers did not perceive as it is useful for continual innovation acceptance of drip irrigation due to various complex factors such as low income of farmers, low operating training and specialized skills, problems in exploitation from water's joint ownership, weakness in mutual understanding among users, insufficiency of distributed water and high cost and low efficiency of technology. Others are lack of proper technology with surrounding conditions of the region and insufficient government support from users. In addition, this finding is

contrary to Bagheri, et al., (2013) that found that perceived usefulness had negative knowledge of farmers on usefulness of using drip irrigation system.

5.3 The influence of Perceived ease of use on Intention to use Drip Irrigation Technology

Drip irrigation system is precision farming technologies that intend farmers to get maximum productivity. At the same time the variable perceived ease of use is very important because if farmers perceived the technology are easy to use they can be influenced to engage in this modern technology. Small holder farmers have to feel themselves that the technology would be free of effort while adopting the drip irrigation farming. The major findings of this study revealed that learning to operate drip irrigation system is ease for the majority of the farmers and ease to get the system to do what they want to do.

Many of the farmers perceived that interaction with drip irrigation system is clear and understandable. Also many of the respondents suggested that interaction with system is quite flexible meant that the system is easy to use and have significant positive effects on behavior intention toward accepting and use of drip irrigation technology. In addition many of the studied respondents believed that it would be ease for them to become skillful on using drip irrigation system but there is a problem on issue of installing of the system. They also said that installing the system requires skillful and well experienced irrigation technician (Haji et al., 2020).

Ranjanand Sow (2020) also found that adoption and management of drip irrigation system requires proper knowledge of the system, climate and environmental

conditions for the growing crops. Zongo et al. (2015) found that lack of knowledge and information is the major obstacle in promoting drip irrigation innovation so they suggested that farmers training and information dissemination are the best ways to increase the acceptance and adoption of this promising technology. The opposite finding were noted in India where finding showed that majority of farmers recognized that drip irrigation system is no longer ease to use for farming due to various reasons such as financial constraints, water scarcity, no subsides from Government, damage by animals, high maintenance cost and lack in technical skills among the farmers(Suresh and kaarthikeyan,2019). It is important of these factors to be tackled accordingly in order to facilitate the smallholder farmers on ease to use the system.

5.4 The influence of Social Pressure on Intention to use Drip Irrigation Technology

The study was concerned with social influence in order to see if it influences the intention to adopt the drip irrigation technology among the smallholder farmers. The result of the study showed that social pressure support from important individual, comments from family members and seeing people using drip irrigation system has great influence to the smallholder farmers on the intention to adopt modern drip irrigation technology, indeed vegetable and fruits growers who had more sources of social influence and support were most likely to have the intention of adopting the technology for farming.

These results are consistent with those of Nato, *et al.*, (2016) found that group involvement and social support are the two important components that can influence

farmers to adopt the new drip irrigation technology. In other hand their study also found that social network, social trust and collective action did not significantly influence the adoption of agriculture production technology. In contrary Frija (2015) found that social network approaches is powerful tool on influencing a smallholder farmers to use modern irrigation system in farming.

Similar results were shown by Ramirez (2013) that found participation of tenants or kinship relationship is a key factor influencing the intention and adoption of irrigation technology. The study further illustrated that farmers intention and adoption behavior may be great influenced by knowledge transfer in there day to day interactions within their social groups. Peers and trust among farmers play a major role in farmer's adoption behavior. The result also suggests that participation in organization and clubs may be a key factor influencing the intention and adoption of drip irrigation technology.

5.5 Influence of Farmers Attitude on Intention to use Drip Irrigation Technology

Results indicated that majority of respondents had positive attitude towards the intention and the use of drip irrigation technology in farming. This means that farmer's positive attitude may influence the adoption and use of drip irrigation technology while negative attitude may affect the intention of the farmers on adopting and using the technology. The findings are supported with Patel et al.(2016) found that the level of attitude of the respondents towards drip irrigation system showed positive and significant relationship with social participation, peer motivation and contact with extension agencies.

The high level of farmer's attitude on the intention and use in this study also confirmed by a study of Singh and Dangi (2022)that found that Chittorgarh's farmers had high attitude level comparatively than Udaipur's farmers in India. Chittorgarh's farmers mentioned that drip irrigation system is the best method for water scarcity conditions, land leveling is not essential if drip irrigation system is used and it is beneficial for farmers as there is an increase in yield crop production.

Awad AL-Zaidi, et al., (2014) mentioned that drip irrigation system require low operating pressure, application is simply managed and has production advantages. This implies that farmers have the positive attitude toward the use of modern irrigation method. Therefore sufficient quantity of water can be saved by the farmers by replacing the old traditionally irrigation method with the modern ones. Contrary to these findings, Thankur and Sharma (2016) found that smallholder farmers have neutral attitude toward modern drip irrigation technology use. They insisted concerted efforts have to be applied in order to change the neutral attitude of farmers into favorable one in order to promote the adoption of modern drip irrigation technology among them, so that they can raise the standard of living and improve the socio economic status in the society.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1 Summary of major findings and conclusions

This study determined the influence of perceived usefulness on the intention to use drip irrigation by smallholder farmers in Magharibi “A” district of Zanzibar. The findings reveal that perceived usefulness has positive and significant influence on the intention to use drip irrigation. This means that the more the smallholder farmers perceive that drip irrigation is useful to them the more the desire to use drip irrigation. In other words, the intention to use drip irrigation by smallholder farmers increases with an increase in perceived usefulness.

On the other hand, the study also determined the influence of perceived ease of use on the intention to use drip irrigation. The results indicate that, perceived ease of use positively and significantly influence the intention of smallholder farmers to use drip irrigation in Magharibi “A” district. This implies that, when farmers perceive that the technology is ease to use, their intention to adopt that particular technology also increases. Smallholder farmers’ attitude was also determined by this study. The findings revealed that the majority of smallholder farmers had positive attitude towards modern irrigation system. Majority of farmers believed that using drip irrigation bring them more yield, income and improve nutritional status in their own house hold.

Moreover, the current study found that increasing social influence among smallholder farmers tends to increase the use of drip irrigation system in the studied area.

Based on the major findings, this study concludes that perceived ease of use, perceived usefulness, farmer's attitude toward use of irrigation system and social influences are antecedents of the intention to use drip irrigation by smallholder farmers in Magharibi "A" district of Zanzibar.

6.2 Recommendations

The following recommendations are suggested towards increasing and continued adoption of drip irrigation technology in Magharibi "A" District.

i. For successful use of drip irrigation technology, the Ministry of Agriculture and Natural resources should make sure that smallholder farmers perceive it useful, perceive it easy to use, have positive attitudes towards use of the technology and capitalize on creating positive social influence among farmers regarding the use of drip irrigation.

ii. In order to enhance the adoption of drip irrigation technologies, it is recommended that the Ministry of Agriculture and Natural Resources should continue providing efficient and effective extension services to smallholder farmers in the study area.

iii. For successful drip irrigation technology in Magharibi "A" district the Revolutionary Government of Zanzibar should allow credit to be offered without collateral to smallholder farmers afford to buy drip irrigation kits.

iv. Department of irrigation must provide sustainable education to farmers in order to increase farmer's awareness hence to increase the numbers of smallholder farmers in Magharibi "A".

v. The Ministry of Agriculture in collaboration with NGos, Private sectors,

International Organization and smallholder farmers should establish networking pertaining the use of drip irrigation system for exchanging information of drip irrigation system among the farmers.

6.2.2 Suggestion for Further Research

This study has successively achieved its objectives. However, there is a need for future research to examine the relationship between the studied variables and demographic variables such as age, gender and education. On the other hand, this was a cross-sectional study, other scholars may decide to use a longitudinal strategy where data are collected in various time to have a full picture of how the tested variables behave in various periods. In addition, future research may opt for the qualitative study which may generate more insights from smallholder holders regarding the studied variables.

REFERENCES

Abdelraouf, R. E., El-Shawadfy, M. A., Ghoname, A. A. & Ragab, R. (2020). Improving crop production and water productivity using a new field drip irrigation design. *Plant Archives,* 20(1).

Abdinoor, A., & Mbamba, U. O. (2017).Factors influencing consumers' adoption of mobile financial services in Tanzania. *Cogent Business & Management,* 4(1), 1-20.

Afrakhteh H., Armand, M., & Askari Bozayeh, F. (2015). Analysis of factors affecting adoption and application of sprinkler irrigation by farmers in Feminine County, Iran. *International Journal of Agricultural Management and Development,* 1, 7-90.

African Union,, A. (2020). Framework for irrigation development and agricultural water management in Africa. 1-25, African Union. 1-25.

Agholor, A. I., & Nkosi, M. (2020). Sustainable water conservation practices and challenges among smallholder farmers in enyibe Ermelo Mpumalanga province, South Africa. *Journal of Agricultural Extension*, *24*(2), 112-123.

Akinyemi, B. E., & Mushunje, A. (2020).Determinants of mobile money technology adoption in rural areas of Africa. *Cogent Social Sciences,* 6(1),1, 1- 63.

Ali, R. M. (2015). Evaluation of the performance of system of rice intensification (SRI) in Bumbwisudi rice irrigation scheme, Zanzibar (Doctoral dissertation, *Sokoine University of Agriculture.),* 1-66. Zanzibar.

Anbari, M., Bagheri, R., & Davodi, H. (2013). Drip irrigation and social factors affecting agricultural water management in Lorestan Province. *Annals of Biological Research,* 4(2), 13-21.

Appukuttan, Suresh & G. M., Kaarthikeyan. (2019). A Study on Understanding the Adoption of Water Saving Technology: A Case Study of Drip Irrigation. 2277-3878.

Awad, Abdullah., &Baig, Mirza., & Elhag, Ahmed. & Al-Juhani, & Al-Zaidi, A. (2014). Farmers' Attitude toward the Traditional and Modern Irrigation Methods in Tabuk Region—, Kingdom of Saudi Arabia. 10.1007/978-94-007-7957-0_8

Ayoub, S. (2019). The impact of population Growth on water Resources Availability in western District-Zanzibar:. Unpublished master dissertation, the Open Universtiy oa Tanzania, Dar es Salaam. A dissertation submitted in partial fulfillment of the requirements for Degree of Master of Arts in natural resources assessment and management of the University of Tanzania, 2-70.

Burke, M. M., Goldman, S. E., Hart, M. S., & Hodapp, R. M. (2016).Evaluating the efficacy of a special education advocacy training program. *Journal of Policy and Practice in Intellectual Disabilities*, 13(4), 269-276.

Canavari, M., Medici, M., Wongprawmas, R., Xhakollary, V., & Russo, S. (2021).A Path Modelof the Intention to Adopt Variable Rate Irrigation in Northeast Italy. *Sustainability*,13, 13(4), 18-79.

Clieb, L., Pauni, R. M. & Malhotra, C.Soiferman, L. K. (2010). Compare and Contrast Inductive and Deductive Research Approaches. roceedings of the IE 2019 International Conference, Online Submission,1-23.481-486.

Das, M. K., Islam, M. M., & Billa, M. M. (2019).Farmers' knowledge, attitude and practice (KAP) regarding nitrogen fortified organic manure in crop production. *Asian Journal of Agricultural Extension,* 393 - 403.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology.MIS quarterly, 319-340.

De Angelis, E., Metulini R., Bove V., Riccaboni, M., 2017.Virtual water trade and bilateral conflicts, Advances in Water Resources, Dependence. *Sustainability*, 13(14).1-7777.

Everaarts, A. P., De Putter, H. & Maerere, A. P. (2015). Profitability, labour input, fertilizer application and crop protection in vegetable production in the Arusha region, Tanzania, *PPO AGV,* 653. 1- 40.

Francisco, L. C., Francisco, M. L., & Juan, S. F. (2015). Payment systems in new electronic environments: Consumer behavior in payment systems via SMS. *International Journal of Information Technology & Decision Making,* 14(2), 421–449.

Frija, I. (2015). Potential of the "Social Network Analysis" approach in mapping irrigation water governance: Case study from South Tunisia. Conference: 29th International Conference of Agricultural Economists At: Rome.

Fue, K. G., & Sanga, C. (2015).Remote scheduling system for drip irrigation system using geographic information system. *Journal of Geographic Information System*, 7(05), 1, 1- 552.

Geda, M. K., & Simegn, A. B. (2016).Production Horticultural Crop and Level of Consumption in Dire Administration, Eastern Ethiopia. *MAYFEB Journal of Agricultural Science,* 45-58.

Girma, Eyerusalem. (2017). Farmers' Adoption Decision and Intensity of use in Soil and Water Conservation Structures in Tigray: The Case of Kilite Awlealo Woreda, unpublished master dissertation, Makele University, Ethiopia..

Gorain, S., Singh, D. R., Kumar, P., Venkatesh, P., & Jha, G. K. (2018).Social Costs and Benefits Analysis of Drip Irrigation System in Northern Maharashtra. *Economic Affairs,* 63(4), 1061-1065.

Gotifridi, P. & Magali, J. (2021). Factors Affecting Use of Mobile Money Services on Loans Repayment for saving and Credits Cooperative Societies (SACCOS) in Rombo District, Tanzania. *The Pan-African Journal of Business Management,* 5(1),: 35 - 48.

Hair, J. F., Celsi, M., Money, A., Samoul, P. & Page, M. (2016). *Essentials of business research methods,* 3 rd . edition, New York: Routledge.

Hoekstra, A. Y. &, Mekonnen, M., (2016). Four billion people facing severe water scarcity, *Science Advances,* 2(2):, 1- 6.

Hossain, S. A. A. M., Lixue, W., Uddin, M. E., Dan, L., Haisheng, L., & Siping, L. (2017). Contemporary Perspective of Drip Irrigation: A Review of Water Saving Crop Production. *Asian Research Journal of Agriculture,* 1, 1-22.

Hussein, Z. (2017). Leading to intention: The role of attitude in relation to technology acceptance model in e-learning. *Procedia Computer Science,* 105, :159-164.

Jitarwal, R. C., & Sharam, N. K. (2007).irrigation technology among farmers inJaipur region of Rajasthan. Indian *Res. Journal of Ext. Educ,* 7(Impact of drip 2(&3),)1-163.

Kaarthikeyan, G. M., & Suresh, A. (2019).A study on understanding water the adoption ofsaving technology: A case study of drip irrigation. *Int. J. Recent Technol. Eng.,* 7(6), 1123-1130.

Kothari, C. R. (2004). *Research Methodology: Methods and Techniques*. 2nd Edition,

New Delhi: New Age International Publishers.

Kumar, A., & Seri, S. P. (2014). Banking on mobile wallet-achieve significant benefits through proactive involvement in mobile wallet. *Global Finance,Infosys, Banglore,* 20-23.

Lamas, D., Loizides, F., Nacke, L., Petrie, H., Winckler, M., & Zaphiris, P. (Eds.). (2019). Human-Computer Interaction – INTERACT 2019. Lecture Notes in Computer Science, 706-710.

Lanlan, Z., Ahmi, A., & Popoola, O. M. J. (2019). Perceived ease of use, perceived usefulness and the usage of computerized accounting systems: A performance of micro and small enterprises (MSEs) in china. International *Journal of Recent Technology and Engineering (IJRTE),* 8(2), 324-331.

Lelissa, T. B. (2018). Research methodology: University of South Africa, PHD Thesis, 1-25.

Ma, Y. J., Gam, H. J., & Banning, J. (2017). Perceived ease of use and usefulness of sustainability labels on apparel products: application of the technology acceptance model. *Fashion Textile,* 4(3):, 1- 20.

Magharib "A" District (2020). Annual Report of Agriculture for Smallholder farmers in vegetable farming, 1-7.

Magzhan, Z. (2021). Does External Shock Influence Farmer's Adoption of Modern Irrigation Technology? —A Case of Gansu Province, China. *Land,* 10(8), 2-16.

Martinez, J., & Reca, J. (2014).Water use efficiency of surface drip irrigation versus an alternative subsurface drip irrigation method. *Journal of Irrigation and Drainage Engineering,* 140(10)1-9.

Maryanne, W. W. (2014). Fraud in the banking industry in Kenya A case of commercial bank of Africa, Kenya. Unpublished (Doctoral dissertation, United States International University Africa, US).

Mike, S. M. (2018). The Influence Of Students Participation In The Social Media On Academic Performance: A Case of Students in The School of Economics and Faculty of Arts of The University of Nairobi. Unpublished (Doctoral dissertation, University of Nairobi), 1-45. Nairobi, Kenya.

Moakofhi, M. K., Phiri, T. V., Leteane, O., & Bangomwa, E. (2019).Using Technology Acceptance Model to Predict Lecturers' Acceptance of Model: Case of Botswana University of Agriculture and Natural Resources. *Literacy Information and Computer Education Journal (LICEJ),* 10 (1),: 3103 – 3113.

Mocănașu, D. R. (2020). Determining the Sample size in Qualitative research.: *In International Multidisciplinary Scientific Conference on the Dialogue between Sciences& Arts, Religion & Education*, 4, (1), 181-187.

Montazar, A., Cahn, M., & Putman, A. (2019). Research advances in adopting drip irrigation for California organic spinach: Preliminary findings. *Agriculture*, 9(8), 177.

Muthui, M. M. (2015). Socio-Economic and administrative factors influencing adoption of irrigation technology in TharakaNithi county (Doctoral dissertation, University of Nairobi),1-60, Kenya..

Narayanamoorthy, A., & Devika, N. (2018). Economic and resource impacts of drip method of irrigation on okra cultivation: an analysis of field survey data. *Journal of Land and Rural Studies*, 6(1), 15-33.

Narayanamoorthy, A., Bhattarai, M., & Jothi, P. (2018). An assessment of the

economic impact of drip irrigation in vegetable production in India. *Agricultural Economics Research Review*, 31(347-2018-31941), 105-112.

Nato, G. N., Shauri, H. S., & Kadere, T. T. (2016). Influence of social capital on adoption of agricultural production technologies among beneficiaries of African Institute for capacity development training programmes in Kenya. Nairobi, Kenya.

Nejadrezaei, N., Allahyari, M. S., Sadeghzadeh, M., Michailidis, A., & Bilali, H. E. (2018). Factors affecting adoption of pressurized irrigation technology among olive farmers in Northern Iran. *Applied Water Science*, 8(190), 1- 9.

Ohk, K., Park, S. B., & Hong, J. W. (2015). The influence of perceived usefulness, perceived ease of use, interactivity, and ease of navigation on satisfaction in mobile application. *Advanced Science and Technology Letters*, 84(2015), 88-92.

Omol, E., Abeka, S., & Wauyo, F. (2017). Factors Influencing Acceptance of Mobile money Applications in Enterprise Management: A Case Study of Micro and Small Enterprise Owners in Kisumu Central Business District, Kenya. *International Journal of Advanced Research in Computer and Communication Engineering*, 6(1), 208-219.

Pallant, J. (2010). *SPSS survival manual: A step-by-step guide to data analysis using SPSS.* Philadelphia: Open University Press Buckingham. Philadelphia. SPSS Inc.., 233 S. Wacker Drive, Chicago, Illinois USA 60606-6307

Patel, J., Kalsariya, B., Marviya, P., & Patoliya, B. (2016)., Attitude of cotton growers towards drip irrigation system (DIS). *AGRES – An International E-Journal*, 5(2), 127-131.

Pokhrel, B. K., Paudel, K. P., & Segarra, E. (2018). Factors affecting the choice, intensity, and allocation of irrigation technologies by US Cotton farmers. *Water*, 10(6), 1-12.

Pronti A., Auci S., Di Paola A., & Mazzanti M. (2019). "What are the factors driving the adoption of sustainable irrigation technologies in Italy? Eighth AIEAA Conference, June 13-14, Pistoia, Italy 300914, Italian Association of Agricultural and Applied Economics (AIEAA). 1- 44.

Pronti, A. (2020). What are the factors driving the adoption and intensity of sustainable irrigation technologies in Italy? CERCIS Working Paper, 1-4304.

Ramirez, A. (2013). The influence of social networks on agricultural technology adoption. *Procedia-Social and Behavioral Sciences*, 79, 101-116.

Ranjan, Shivani. & Sow, Sumit. (20210). Drip Irrigation System for Sustainable Agriculture. *Food and Scientific Reports*, 2(3), 30-32.

Razzaq, A., Rehman, A., Qureshi, A. H., Javed, I., Saqib, R., & Iqbal, M. N. (2018). An economic analysis of high efficiency irrigation systems in Punjab, Pakistan. *Sarhad Journal of Agriculture,34,* 34(4), 818-826.

Rigopoulos, G., Psarras, J., & Askounis, D. (2008).A TAM model to evaluate user's attitude towards adoption of decision support systems. *Journal of applied sciences*, 8(5), 899-902.

Sacks, M., & Bernstein, N. (2011).Utilization of reclaimed wastewater for irrigation of field-grown melons by surface and subsurface drip irrigation. *Israel journal of plant sciences,* 59(2-4), 159-169.

Sánchez-Alzate, J. A., & Sánchez-Torres, J. A. (2017).Analysis of social factors and their relationship with perceived risk for e-commerce purchases. Dyna,

84(200), 335-341.

Shaik, M. S. R. & Khandave, S. (2019). Socio Economic Impact of Drip Irrigation System on Drip Owners. *Indian Research Journal of Extension Education,* 19(4), 92-95.

Singh, N., & Dangi, K. L. (2022). Attitude of farmers towards drip irrigation system in Southern Rajasthan. *The Pharma Innovation Journal,* 11(1S), 1363-1365.

Sudhir, K., Pandey, M. & Tewari, I. (2012). MobilebankingMobile banking in India: barriers and adoption triggers. Mobile Banking Experience the Freedom. 20 report-Final. Pdf. 1-76.

Tavakol, M., &Dennick, R. (2011). Making sense of Cronbach's alpha. *International journal of medical education*, *2*, 53.

Thakur, P., & DD, S. (2016). Farmer's Attitude towards Modern Farm Mechanization. International Journal of Applied and Pure Science and Agriculture (IJAPSA), 2(8), 158-164.

To, A. T., & Trinh, T. H. M. (2021). Understanding behavioral intention to use mobile wallets in Vietnam: Extending the tam model with trust and enjoyment. *Cogent Business & Management,* 8(1), 1-10.

UN, (20158). Water for a sustainable world, The United Nations World Water Development Report, 2015, 1-6.

Valizadeh, N., Rezaei-Moghaddam, K., & Hayati, D. (2020). Analyzing Iranian farmers' behavioral intention towards acceptance of drip irrigation using extended technology acceptance model. *Journal of Agricultural Science and Technology*, *22*(5), 1177-1190.

Valizadeh, N., Rezaei-Moghaddam, K., & Hayati, D. (2020). Analyzing Iranian

farmers' behavioral intention towards acceptance of drip irrigation using extended technology acceptance model. *Journal of Agricultural Science and Technology,* 22(5), 1177-1190.

Verma, P., Chandel, J. S. & Sharma, N. C. (2020). Perspective of drip irrigation in temperate fruits in India–A review. *Journal of Soil and Water Conservation*, 19(2), 149-155.

Viswanathan, P. K., &Bahinipati, C. S. (2015).Exploring the socio-economic impacts of micro-irrigation system (mis): A case study of public tube wells in Gujarat, Western India. *South Asia Water Studies Journal,* 1(1), 1-25.

Wang, J., Bjornlund, H., Klein, K. K., Zhang, L. & Zhang, W. (2016).Factors that Influence the Rate and Intensity of Adoption of Improved Irrigation Technologies in Alberta, Canada. *Water Economics and Policy*, 2(3), : 1 –- 32.

Wheeler, S. A., Bark R., Loch A. & Connor J. (2015). Agricultural water management, in Dinar A. & Schwabe K. (eds). "*Handbook of Water Economics"*, Cheltenham: Edward Elgar Publishing Limited, Cheltenham (UK), 659- 673..

Wu, W. K., Huang, S. C., Wu, H. C., & Shyu, M. L. (2021). The Effects of the Social Influence Approach on Swift Guanxi, Trust and Repurchase Intention When Considering Buyer Dependence. *Sustainability*, 13(14), 7777

Yao, L., Zhao, M., & Xu, T. (2017).China's water-saving irrigation management system: Policy, implementation, and challenge. *Sustainability*, 9(12), .9-2339.

Zongo, B., Diarra, A., Barbier, B., Zorom, M., Yacouba, H., & Dogot, T. (2015).

Farmers ‘practices and willingness to adopt supplemental irrigation in Burkina Faso. *International Journal of Food and Agricultural Economics* (IJFAEC), 3(1128-2016-92070), 101-117.

ZSGRP, (2017). Zanzibar strategic for growth and reduction of poverty (ZSGRP) 2016-2020 MKUZA III. The revolutionary Government of Zanzibar, pp1-7. ZSGRP.

APPENDICES

Appendix 1: Questionnaire

My name is Amour UzziVuai, conducting the research titled“ Factors affecting the adoption of drip irrigation technology: Empirical evidence from horticultural production project in Magharibi “A” district of Zanzibar*”* in partial fulfillment of the award of Masters of Project Management Degree of the Open University of Tanzania. All data acquired from you will be concealed with a high level of confidentiality. Please do not disclose identification or names in this questionnaire.

SECTION A: Respondent´S Profile

Please tick the most appropriate answer (√)

1. **Age (please tick accordingly)** 20 - 30 ( ) 31 - 40 ( )
   41 -50 ( ) Above 51 ( )
2. **Gender:** Male ( ) Female ( )
3. **Marital status**: Married ( ) Single ( ) Widowed ( )
   Separated ( )
4. **Number of years working in the organization**
   Less than one year ( ) 2-5 years ( ) 6-10 years ( )
   Above 11 years ( )
5. **Experience in using drip irrigation (years)**
   Less than five year ( )
   5 – 10 ( )
   11 – 20 ( )
   21 -30 ( )

6. Which is your highest education level?

Certificate ( ) Diploma ( ) Degree ( ) Masters ( )

Ph.D. ( )

7. Extension service

Yes ( ) No ( )

8. Access to finance

Yes ( ) No ( )

SECTION B: Relationships amongst the variables

In this section please tick (√) the most appropriate response for each of the statements in the table below with the following scores in mind. **1 = Strongly Disagree, 2 = Disagree, 3 = Not Sure, 4 = Agree, and 5 = Strongly Agree**

Please tick only **ONE in each** scale which you think is BEST

MEASURES OF PERCEIVED USEFULNESS					
Statement	**1**	**2**	**3**	**4**	**5**
9. Using drip irrigation would enables me to accomplish tasks more quickly					
10. Using drip irrigation would improve productivity					
11. Using drip irrigation would improve my performance					
12. I would find the drip irrigation useful in my job					
13. Using drip irrigation would make it easier to do my job					

14. Using drip irrigation enhance my effectiveness and efficiency on my job					
MEASURES OF PERCEIVED EASE OF USE	**1**	**2**	**3**	**4**	**5**
15. Learning to operate drip irrigation would be easy for me					
16. I would find it easy to get the system to do what I want it to do					
17. My interaction with drip irrigation system would be clear and understandable					
18. I would find drip irrigation to be flexible to interact with					
19. It would be easy for me to become skillful at using drip irrigation					
20. I would find drip irrigation system easy to use					
21. I would find drip irrigation easy to install					
MEASURES OF SOCIAL INFLUENCE	**1**	**2**	**3**	**4**	**5**
22. My friends would motivate me to use drip irrigation					
23. Individuals whom I regard important would support me to use drip irrigation					
24. I would buy drip irrigation if commended by a member of my family					
25. Positive responses from friends and family towards drip irrigation increases my motivation to use it					

26. I am concerned with other's comments regarding drip irrigation					
27. When I see people using drip irrigation, I want to do it as well					
MEASURES OF ATTITUDES TOWARDS USE OF DRIP IRRIGATION	**1**	**2**	**3**	**4**	**5**
28. I think that using drip irrigation system is better than rain fed farming					
29. I would like to use drip irrigation system more in my farming activities					
30. I believe using drip irrigation system would improve my work					
31. I think drip irrigation system is an effective technology for saving irrigation water					
32. Farming with drip irrigation system is exciting					
33. My attitude towards using drip irrigation system make me intend to use it					
34. My attitude towards using drip irrigation system makes me accept to use it					
MEASURES OF INTENTION TO USE DRIP IRRIGATION	**1**	**2**	**3**	**4**	**5**
35. It is important for farmers to engage in drip irrigation farming					

36. When farmers engage into drip irrigation farming their farm produces increases					
37. Drip irrigation promotes social and economic development to communities					
38. I will use drip irrigation farming in the future					
39. Using drip irrigation farming improves the living standards of farmers					

Thanks in advance for your participation in this study.

THE OPEN UNIVERSITY OF TANZANIA

DIRECTORATE OF POSTGRADUATE STUDIES

P.O. Box 23409
Dar es Salaam, Tanzania
http://www.out.ac.tz

Tel: 255-22-2668992/2668445
ext.2101
Fax: 255-22-2668759
E-mail: dpgs@out.ac.tz

Our Ref: PG2017997116

19th July, 2022

Director,
Department of Irrigation,
P.O. Box 159,
Mwera,
ZANZIBAR.

RE: RESEARCH CLEARANCE

The Open University of Tanzania was established by an Act of Parliament No. 17 of 1992, which became operational on the 1st March 1993 by public notice No.55 in the official Gazette. The Act was however replaced by the Open University of Tanzania Charter of 2005, which became operational on 1st January 2007.In line with the Charter, the Open University of Tanzania mission is to generate and apply knowledge through research.

To facilitate and to simplify research process therefore, the act empowers the Vice Chancellor of the Open University of Tanzania to issue research clearance, on behalf of the Government of Tanzania and Tanzania Commission for Science and Technology, to both its staff and students who are doing research in Tanzania. With this brief background, the purpose of this letter is to introduce to you **Mr. Amour Uzzi Vuai, Reg** No: **PG2017997116**) pursuing **Masters of Project Management**. We here by grant this clearance to conduct a research titled **"Factors Affecting the Adoption of Drip Irrigation Technology".** He will collect his data in Mbweni, Kianga, Chuini, Kizimbani, Dole and Mwera areas from 21th July to 30th August, 2022.

In case you need any further information, kindly do not hesitate to contact the Deputy Vice Chancellor (Academic) of the Open University of Tanzania, P.O.Box 23409, Dar es Salaam.Tel: 022-2-2668820.We lastly thank you in advance for your assumed cooperation and facilitation of this research academic activity.

Yours,
THE OPEN UNIVERSITY OF TANZANIA

Prof. Magreth S.Bushesha
DIRECTOR OF POSTGRADUATE STUDIES.

THE REVOLUTIONARY GOVERNMENT OF ZANZIBAR
MINISTRY OF AGRICULTURE, IRRIGATION, NATURAL RESOURCES AND LIVESTOCK

DEPARTMENT OF IRRIGATION

P.O.Box. 159
MBWENI, ZANZIBAR-
Email: zanziirri64@yahoo.com

Telephone: 024-2242064
Fax : 024-2234650

Ref. No. IRR/ **29 August 2022**

Mr. Amour Uzzi Vuai
Department of Irrigation
Ministry of Agriculture, Irrigation, Natural Resources and Livestock
Zanzibar

DARA YA UMWAGILIAJI MAJI
P.O. Box 159
ZANZIBAR 29/8/2022

RE: RESEARCH CLEARENCE

Pleased to refer you to the above heading

This is to kindly informing you that, the permission has been granted for you to conduct your research study titled "Factors affecting the adoption of Drip Irrigation Technology "from 19th July to 30th August, 2022 as requested by your University through letter no. PG2017997116 of 19th July, 2022

We wish you a success in your endeavor

.....
Haji H. Saleh
DIRECTOR
DEPARMENT OF IRRIGATION