INFLUENCE OF FARMER FIELD DAYS IN COMMUNICATING AGRICULTURAL RESEARCH INFORMATION AT THE MWEA IRRIGATION AGRICULTURAL DEVELOPMENT (MIAD) CENTRE: A CASE OF TOPSHOT HERBICIDE

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DECLARATION

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This project report has been submitted with my approval as the university supervisor.

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DEDICATION

This project is dedicated to my Mother Zipporah. Her endless resolve to break all barriers and see me excel academically has been a great motivation throughout my academic journey. I also dedicate this project to my late Uncle Dad Nyaga, whose words of affirmation and refusal to allow the society to pull me down gave me the will to rise above my challenges and pursue further studies. Moreover, this one is for you all, young girls of Nkujia Village in Tunyai Location in Tharaka Constituency, who have been told it is impossible to be a woman who wears that crown of academic excellence in a stereotyped community that sees women as only made for the kitchen and child bearing. Relentlessly seek that light at the end of the tunnel…This one is for you!

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS AND ACRONYMS

ASDS	Agricultural Sector Development Strategy
CAADP	Comprehensive Africa Agriculture Development Programme
COVID-19	Corona Virus Disease - 2019
CRF	Coffee Research Foundation
DOI	Diffusion of Innovation Theory
EPAs	Extension Planning Areas
ESA	Eastern and Southern Africa
FAO	Food and Agricultural Organisation
FFDs	Farmer Field Days
FFS	Farmer Field Schools
GOK	Government of Kenya
ICT	Information, Communication and Technologies
KALRO	Kenya Agricultural and Livestock Research Organization
KEFRI	Kenya Forestry Research Institute
KESREF	Kenya Sugar Research Foundation
KTDA	Kenya Tea Development Agency
MFI	Micro Finance Institutions
MIAD	Mwea Irrigation Agricultural Development Centre
MOA	Ministry of Agriculture
NALEP	National Agricultural Extension Policy
NIB	National Irrigation Board
PSC	Parliamentary Service Commission

SACCOS Savings and Credit Cooperative Societies

SPSS Statistical Package for the Social Sciences

TRF Tea Research Foundation

UON University of Nairobi

WRSC Water Rice Saving Culture

ABSTRACT

The objective of the study was to examine the influence of farmer field days (FFDs) in communicating agricultural research information at the Mwea Irrigation Agricultural Development (MIAD) Centre, in a case study of Topshot Herbicide. Three specific objectives guided the study; to explore the effects of farmer field days on knowledge of Topshot Herbicide among rice farmers at the Mwea Irrigation Scheme; to determine the influence of farmer field days on attitudes towards Topshot Herbicide among rice farmers at the Mwea Irrigation Scheme; to establish the influence of farmer field days on adoption of Topshot Herbicide among rice farmers at the Mwea Irrigation Scheme. The study was based on the Diffusion of Innovation Theory. A descriptive research design was adopted targeting 524 rice farmers who participated in the Topshot Herbicide Farmer Field Day, from which a sample size of 157 respondents was generated. Simple random sampling was used to select respondents for the final sample of 117 respondents. Questionnaires, interview guides, and document analysis were the methods used to collect data. A pilot study was conducted among 15 respondents to establish the reliability and validity of the instrument. Cronbach Alpha was used to determine the reliability of the instrument. The data was analyzed using SPSS and consisted of descriptive statistics (mean, frequencies and percentages) for the quantitative data whilst thematic analysis was used to analyze the qualitative data. The study concludes that participation in FFDs resulted to knowledge of Topshot Herbicide, led to positive attitudes towards Topshot Herbicide, and increased adoption of Topshot Herbicide. The study recommends that FFDs should be used more to promote adoption of emerging agricultural innovations as they complement the sharing of information which is often done by extension officers, who are few compared to the large numbers of farmers. Through FFDs, farmers can themselves become extension agents in their locality and communicate agricultural information to other farmers through peer to peer interactions. FFDs should be used regularly especially in cases where new agricultural technology is being introduced for the first time, in order to facilitate immediate feedback, as well as give room for adjustments depending on what the farmers think is working for them and what is not working. Tailor-making FFDs according to the age, language, perception and education level of the farmers being targeted is instrumental to achieving successful results as a one-size-fit-all FFD may not have the same outcome in one location as it had in another.

CHAPTER ONE: INTRODUCTION

1.0 Overview

This chapter introduces the background of the study, problem statement, general and specific objectives, research questions derived from the research objectives, justification of the study, significance of the study, scope of the study and operational definition of terms.

1.1 Background of the Study

In developing countries, a lot of knowledge on agricultural research is out of reach for those who require to make a change in agricultural practice (Payumo et al., 2018). The extent to which the economy of a nation grows is dependent on the efficiency of the set up mechanisms to exchange ideas between several actors that operate in a system (Payumo et al., 2018). Majority of the western nations are at the leading position of food security owing to the generation and delivery of agricultural information to their people (Sani et al., 2014).

The creation and dissemination of agricultural information is a critical component of developing agricultural products. There are many projects that have been created to use and manage agricultural information in Africa so as to enhance food productivity. Well-presented and adequate information can increase the efficiency of rural development, programmes, projects, and policies (Sani et al., 2014). The provision of agricultural information should be the most important part of rural development programmes. According to Oladele (2011), the lack of agricultural information is a major force that has hindered the agricultural advancement needed in agricultural production in the less developed countries.

Agricultural information influences and interacts with agricultural activities in several ways. Opara (2008) notes that agricultural information has the ability to increase agricultural production, and in the long term can make a greater effect on farming communities,

researchers, and policy makers in Africa. Agricultural research is critical to finding out ways of combating emerging strains of pests, insects, weeds, bacteria, and fungi that result in crop destruction and is also the best means with which to identify new varieties of animals and crops with better yields, tolerant tot droughts, and resistant to diseases. The goal of feeding the globe's population by 2050 is futile without agricultural research (Ikileng, 2014).

1.1.1 Food Security and the Big Four Agenda

Kenya's agriculture sector directly accounts for 24% of the country's Gross Domestic Product (GDP), and the Government revenue of approximately 45 % is from the agricultural sector. The sector also accounts for over 60% of the employment in the country, both directly and indirectly. More than 80% of the world's people live in the rural regions and get their livelihood from agricultural production. Despite this however, a report by the Kenya Agricultural and Livestock Research Organization (KALRO) indicates that over 10 million Kenyans are food insecure (KALRO, 2018). This prompted the Government of Kenya to prioritize the agriculture sector in the new Big Four Agenda action plan to promote sustainable national development (GOK, 2018)

The 2017 Global Food Security Index indicates that Kenya is a food insecure nation, as it ranked 86 out of 113 nations and this ranking fell to position 87 in 2018 (The Economist Intelligence Unit, 2018). The index was based on safety, availability, affordability, and quality of food, resilience, and natural resources. The Global Food Security Index 2018 cited funding and implementation of high technology agricultural research and innovation in farming practices as one of the most effective ways of combating food insecurity. The report notes that the ability of farmers, extension agents, agricultural researchers and those high up the value chain to identify and implement coping strategies and adaptive options depends on

technical knowledge and the resources availed to them (The Economist Intelligence Unit, 2018).

An assessment of Kenya's food balance sheet indicates that imports consist of some of the most basic products such as maize, sugar, wheat, potatoes, and beans. These imports accounted for almost 25% of the grains consumed in 2010 and this later increased to 32% five years later and were anticipated to hit 40% in 2017 (Parliamentary Service Commission, 2018). In December 2017, Kenya's President Uhuru Kenyatta announced the Big Four Agenda action plan that guides the country's development agenda between 2018 and 2022. The Big Four Agenda aims to focus on fundamental needs of the people that are important in uplifting the living standards of Kenyans as the country works towards becoming an upper middle-income country by 2030, which is envisioned under Kenya's Vision 2030 action plan.

The four pillars under the Big Four Agenda are: Affordable and Decent Housing, Universal Health Coverage, Food and Nutritional Security, and Manufacturing (PDU Delivery, 2019). There are various initiatives outlined under the Food and Nutritional Security pillar which include increasing smallholder productivity, increasing large-scale production, and reduction in food costs as a percentage of income by 47% which currently stands at an average of 52.2% in Kenyan households, creating 1,000 agro processing SMEs (value addition) and 600,000 new jobs, increasing annual maize production to 67 million bags, increasing annual rice production to 400,000 tonnes through the expansion of the Mwea Irrigation Scheme, reduce malnutrition in children under five years by 27%, reducing the number of food insecure Kenyans by 50%, removing the several taxations across the counties in the agricultural value chain, enhancing the provision of extension services to the farmers in the Counties, availing inducement for post-harvest technologies to lessen the total

losses experienced in post-harvest, and provision of affordable energy to reduce the cost of production (The Presidency, 2019).

Maize is a cornerstone for Kenya's food security, where the country recorded 42.5 million bags in 2015, an increase from 40.7 million bags collected in 2013, which later reduced to 35.4 million bags in 2017. The production of wheat was 214,700 tonnes in 2016, declining to 165,200 tonnes in 2017 from a high of 194,500 tonnes in 2013. All in all, the situation of food supply as indicated by the Food Balance Sheet in terms of energy indicated that there was an improvement from 2,202 kilo calories in 2014 which increase to 2,288 kilo calories the following year and this reduced to 2,123 kilo calories in 2017. The food self-sufficiency ratio was 75.2 % in 2015, 74.4% in 2014 and 60.0% in 2017. In terms of rice production, there has also been a decline from 125,256 to 81,200 tonnes from 2013 to2017 which was associated to the dry spell of 2017 which affected water availability in Kenya's rice irrigation schemes (Government of Kenya, 2018).

The local rice production currently stands at an average of 120,000 tonnes against a demand of 400,000 tonnes annually, leaving the country to import the deficit to bridge the supply and demand gap (NIB, 2019). The Government of Kenya plans to increase the acreage under irrigation at the Mwea Irrigation Scheme from the current 25,000 acres to 35,000 acres to boost rice production in the country. The increased acreage at the scheme will facilitate double cropping per annum, which will double local rice production at the scheme to 160,000 tonnes of rice annually, up from the current 80,000 tonnes. The National Irrigation Board is undertaking the construction of Thiba Dam in Kirinyaga County to improve the reliability of irrigation at the scheme. The scheme accounts for 80% of all rice produced in Kenya (NIB, 2019).

1.1.2 Agricultural Framework in Kenya

Vision 2030 is a development programme for Kenya's economic and social development in the next one decade. In the Vision, agriculture is identified as a key sector in achieving the envisaged annual economic growth rate of a double digit from the current rate that averages 6% up to a growth rate of above 10%. The Vision 2030 resulted to the revision of the Strategy for Revitalizing Agriculture (2004-2014) which also resulted with the revision of the Agriculture Sector Development Strategy (2010-2020) which promises to propel Kenya to a food prosperous and secure country by 2020 and its objective is to create a change to business farming from subsistence farming (Food and Agricultural Organisation, 2012).

The Agriculture Sector Development Strategy (ASDS) is designed to the agenda of the Comprehensive Africa Agriculture Development Programme (CAADP) pillars which consist of agricultural research, water and land management, food hunger and supply, and market access, technology dissemination and adoption (FAO, 2012). One of the thematic areas of The ASDS consists of institutional and regulatory reforms, legal, financial services, inputs, extension, and research (FAO, 2012). The policy also aims to enhance, streamline, and rationalize organization of agricultural research services to make sure the industry can achieve its mandate of creating 10 % of yearly economic growth as imagined under the economic pillar of the Vision 2030 (Government of Kenya, 2012)

Kenya is also guided by the Sustainable Development Goals (SDGs) in her quest to end poverty and improve food security, and in particular goal number 2 whose goal is to reach food security, finish hunger, promote sustainable agriculture, and enhance nutrition (UNDP, 2017). This has also been captured under the Food Security pillar of the Big Four

Agenda (The Presidency, 2019). The Maputo Declaration (2003), on Agriculture and Food Security is also another policy that Kenya subscribes to.

The declaration calls on Governments to allocate at least 10 % of their national budget to agricultural development. Kenya currently allocates an average of 3% of her national budget to the Agriculture sector (GOK, 2018). The National Agricultural Sector Extension Policy (NASEP) identifies extension services as priority functions of the agricultural sector, and outlines the process for effective organization and management of agricultural extension in a diversified systems where private and public service providers are both active (Government of Kenya, 2012).

The National Agricultural Research System Policy (NARS) understands the critical part that development in agricultural technology and application can make in modernizing and transforming agricultural research in Kenya. This directive focuses to rationalize and streamline a system in place that is effective, efficient, and consultative and that takes into consideration the scale of economies not to only rely on the existing psychical, human, and scientific capabilities but also create a position where Kenya is a centre for agricultural development and research in the region (Government of Kenya, 2012).

The Guidelines and Standards for Agricultural Extension and Advisory Services provide comprehensive approaches, methods and standards for coordinating and managing the delivering of advisory and extension agricultural services (Government of Kenya, 2012). Kenya's Constitution of 2010 places agricultural research under the purview of the central government whilst farmer services through agricultural extension are under the purview of the county governments.

1.1.3 Agricultural Information Dissemination Approaches

Agricultural research findings have been disseminated in different methods and approaches across the world. In China, Zhang, Wang, and Duan 2016) reviewed and identified information communication technologies (ICTs) information diffusing methods in China and which were popular in sharing experience and knowledge in diffusing agricultural information for farm communities and farmers to enhance economic, productivity, social, and environment sustainability. In Pakistan, Yaseen, Siddiqui, Ali, and Ameen (2014) reported that majority of information was received through pesticide dealers; fellow farmers, private sector, television, agriculture Department, and radio respectively.

In Ghana, Lamptey, Sambo, and Hassan (2016) showed that the use of Web 2.0 and ICTs by libraries improved the dissemination of information to farmers through the deployment of extension officers', which improved agricultural productivity. In Uganda, Girma, Zeyaur, Pittchar, and Ochatum, (2017) found that despite the large audience through radio listenership, agricultural programs were not a major component of radio programs with time allocation for agricultural programs comprising only 15 percent of total time allocation. Chepkoech (2015) reported that a range of other extension methods have been employed in the dissemination of information in Kenya. These include the field days, agricultural shows, face-to- face extension services, on-farm demonstrations, farmer teachers, mass media (radio-Tembea na Majira and Citizen TV's programme - Shamba shape up), public gatherings (chief`s Barazas), printed matter, and farmer field schools (Khan et al., 2008; Amudavi et al., 2009).

Mgbenka et al (2013) was of the opinion that the most useful communication channels that extension officers adopt to adequately diffuse information to farmers are those

that endorse face-to-face connections that include farmer visits, meeting, field days, and discussions. These forums can be relied on by well government staffing and funding of research institutes and extension agencies. Cheboi and Mberia (2014) are also of the opinion that interpersonal approaches in adoption and diffusion of zero grazing were peers, church, demonstrations, public barazas, meetings, field days, family members, and opinion leaders. Other studies (Okwu & Daudu, 2011; Wafula, 2015; Kigatiira et al., 2018) also found evidence that seminars, opinion leaders, trade fairs, field schools, chief barazas, mobile phones, school and church meetings, extension visits, demonstration, farmer to farmer, field days, and agricultural shows were some of the interpersonal techniques of communication for agricultural messages.

1.1.4 Farmer Field Days and Dissemination of Agricultural Information

The concept of farmer field days is that they are a useful technique for interpreting, confirming, training, and demonstrating the information that is received and can be a great determinant towards adoption (Emerick et al., 2016). According to Mugo, Nyanganga, Hoka, and Njeru (2013), field days is a widely used approach for transferring technology to farmers. The use of field days in farmer's fields is a positive means of convincing other farmers to adopt a new or emerging technology. During these field demonstrations, farmers from the neighborhood get a chance to see how new forms of technology are being used in the field and this might motivate, fast track, or facilitate adoption of this technology.

Talibo (2011) asserts that field days are very important for non-participants to experience from their outcome and share their skills. Field days give the chance for non-active participants to be exposed to the lessons of the group and the knowledge and skills gained in the process. These field days are also used as a point of reference to come up with

conclusions of the learned skills. /Field days also give the members of the group a chance to share and display their experience with others such as the leaning activities and experimentation results which include group dynamics while raising awareness and reinforcing cohesion among the community members.

The field days are chances to hold mainly result or method oriented demonstrations on a larger scale. In majority of times, field days are open events that are planned to stimulate an awareness or interest and introduce a new idea to as many farmers as possible. The objective of field days is to encourage informal and open atmosphere where farmers visiting can question, learn, inspect, and inquire from fellow farmers and field officers. This environment of learning is informal and may also include invitation of special guests, refreshments, awards, ceremonies, music and meals (Koutsouris et al., 2017).

1.1.5 Agricultural Research in Kenya

The need for improved food production in the country that meets the needs of every citizen has over the years prompted the Government of Kenya to look into modernization and commercialization of agriculture. Agricultural research in Kenya has progressed from just a function of the Ministry of Agriculture back in the 1980s, to semi-autonomous institutions, the private sector and universities (Sani et al., 2014). Agricultural research in Kenya is guided by the Science and Technology Act Cap 250, the Companies Act and the Agriculture Act Cap 318 and the Universities Act 2012 Cap 210B. Agricultural research in Kenya is majorly carried out in various research institutions, both public and private. The objectives of such institutions include conducting research and developing technology that addresses the challenge of food insecurity in the country, as well as to provide farmers with timely,

relevant information that would help them increase their yields and maximize on their returns (KALRO, 2019).

According to the Kenya Agricultural and Livestock Research Organization (KALRO), the mandate of the various research institutes in the country, which mostly operate under KALRO, include developing suitable systems that promote sustained, diversified, and balanced agricultural development to increase agricultural production by investigative and adaptive research to facilitate the adoption of improved technology for production and establish suitable feedback mechanism from agricultural producers (KALRO, 2017). This ranges from availing information about new seed varieties, appropriate fertilizer varieties for different areas, handling of pests and diseases, the right pesticides to use for particular crops and at different stages of growth, harvest and post-harvest handling, irrigation technologies, cross breeding in both plants and animals, among others. The output of agricultural research is an important part of knowledge that should be made accessible to farmers via sources that are not only acceptable to them but also available (Sani, Boadi, Oladokun, & Kalusopa, 2014).

The system of agricultural research that consists of private and public agricultural research organizations established under different institutional and legal frameworks. The Kenya Agricultural and Livestock Research Organization (KALRO), comprises of 16 semi-autonomous institutes that conduct appropriate research in their respective fields concerning crops and animals; the Kenya Forestry Research Institute (KEFRI) deals with research in forestry and natural resources; the Kenya Marine and Fisheries Research Institute (KMFRI) handles research related to marine life; and the Kenya Industrial Research and Development Institute (KIRDI) deals with research in industrial technology. These are Parastatal research

institutions established under the Science and Technology (Amendment) Act of 1979, each with a specific independent mandate (Government of Kenya, 2010).

The Coffee Research Foundation (CRF), the Tea Research Foundation (TRF), the Kenya Sugar Research Foundation (KESREF), and the Kenya Seed Company (KSC) are State corporations registered under the Companies Act (Cap 486) worked independently since 1964, up until 2014 when they were dissolved and merged under the Kenya Agricultural and Livestock Research Organization (KALRO). The Coffee Research Foundation was also transformed into the Coffee Research Institute under KALRO (KALRO, 2017), while the KSC is engaged in agricultural research related to seed production and distribution, the National Irrigation Board (NIB) created under the state corporations act has a division of research which conducts research on irrigation practices and technologies (Government of Kenya, 2010). The board has a research wing known as the Mwea Irrigation Agricultural Development Centre (MIAD), which is the main research and training station on irrigated agriculture in Kenya (NIB, 2019).

Universities in Kenya are established under various Acts and charters including the Universities Act 2012 Cap 210 (Kenya Law Reports, 2012) and have faculties of allied sciences and agriculture that conduct agricultural research alone or in conjunction with other agricultural research organizations in the country (KALRO, 2018). Several regional and international research organizations undertaking agricultural research including the International Livestock Research Institute (ILRI) based in Kenya, whose mandate is to improve food security in developing countries through sustainable use of livestock, and the International Potato Center (CIP) which focuses on research on roots, tubers and bananas. These institutions have international and regional functions and create chances for

complementing and enhancing the national agricultural research agenda (Government of Kenya, 2010).

1.1.6 Adoption of Agricultural Technology

There has been evidence of research and interest in the adoption of agricultural technology in developing nations since the early 80s. Feder et al. (1985) admits that use of technological innovations in agriculture has created more attention among development economists as most of the population of nations that are less developed derive their livelihood from agricultural production and because new technology creates the chance to enhance income and production sustainably (Ochienno, 2014).

The introduction of most technologies has only been met with limited adoption. The behaviour of adoption may be shown in more than one determinant and can be influenced by a unique selection whether or not to use an innovation of a continuous determinant that shows the degree to which an innovation that is divisible can be used. Onasanya, Adedoyin, and Onasanya (2006) agree that adoption of innovation among the grassroots farmers is very low. They further contend that the use of communication skills, media and methodologies is typically abhorred and fragmented.

1.1.7 Mwea Irrigation Agricultural Development (MIAD) Centre

The Mwea Irrigation Agricultural Development Centre (MIAD) is based at the Mwea Irrigation Scheme, in Kirinyaga County. Established in 1991, the center was as a result of the cooperation program between the government of Japan and Kenya as the center was created for irrigation technology transfer and development. The center grew to become the major training and research station on irrigated agriculture in Kenya (NIB, 2019).

The location of the MIAD Centre is strategic, and it serves over 7,000 rice farmers stationed at the Mwea Irrigation Scheme, operating 26,000 acres of land under irrigated rice. The Mwea Irrigation Scheme is run under the management approach of participatory irrigation and represented eighty percent of all rice production in the in the country at an average of 80,000 tonnes annually (NIB, 2019). Other Schemes include the Bura Irrigation Scheme, the Hola Irrigation Scheme, the Perkerra Irrigation Scheme, the Ahero Irrigation Scheme, the Bunyala Irrigation Scheme and the West Kano Irrigation Scheme.

The MIAD Centre carries out research and shares information with farmers concerning multiple (double) cropping techniques, rice germ-plasm maintenance, rice seed production and certification, farm water management techniques, crop husbandry techniques, wetland preparation techniques, soil, water and plant tissue analysis, fertilizer and pesticide application techniques, proper implementation of mechanized agriculture, weed control techniques, irrigation and drainage research, as well as advisory extension services to farmers, collaborative research with other stakeholders and conducting unique in-house training towards irrigation management (NIB, 2019).

Around 80% of Kenya's national rice production is from the national irrigation schemes that are operated and managed by the National Irrigation Board. The rice growing schemes are Mwea in Central Kenya, Ahero, West Kano and Bunyala in the Western part of the country (Atera et al., 2018). Rice production gets a negative impact of disease and pests such as bird damage, parasitic weed striga, leaf blight, and rice midge. The most common paddy field weeds include: Small flower umbrella, (Cyperus difformis), Red sprangle top, (Leptochloa chinensis), Barnyard grass (Echinocloa crus-galli), Creeping water primrose, (Ludwigia adscendens), Oval leaf Monocharia, (Monocharia vaginalis), Long fruited primrose,

(Ludwigia octovalvis), Purple Ammania, (Ammania coccinea), Sphaeranthus, (Sphaeranthus spp.,), and Bulrush, (Scirpus juncoides) (Bruce, 2010). This means that any increase in rice production in the future can only be as a result of improvement in yield by expansion of production area and lessening storage and field losses (Atera et al., 2018).

1.2 Statement of the Problem

Kenya's food production has been reducing in the last five years (Ministry of Agriculture, 2018). The production of Kenya's main staple food has reduced from 40.7 million bags to 35.8 million bags from 2013-2017 which is much lower than consumption nationally which is 45 million bags per year (MoA, 2018). One of the factors that have been associated with Kenya's food insecurity situation has been the inadequate research and farmer extension linkages (Parliamentary Service Commission, 2018). The Agricultural Sector Development Strategy (ASDS) notes that despite the country having a well-advanced agricultural system that includes adoption of modern technology and science in agricultural production is still low. The inadequate extension services and research links to create a demand-driven research and enhance the utilization of enhanced technologies continues to limit the efforts to increase agricultural productivity (GoK, 2018).

There has been an increasing promotion of extension services and agricultural information using television, radio, Information Communication Technologies (ICTs) such as social media, websites, and Smartphone apps mostly due to the lack of adequate extension officers and agents (Tata & Mcnamara, 2017). Despite the use of these channels of communication, dissemination of agricultural research information has not been effective as expected and this has been associated with the poor interpersonal contact between farmers, extension services and research organizations (Musa et al., 2013). Agricultural research

information is effective if it leads to acceptance of the proposed innovation or technology which can be attributed to farmers' attitudes, knowledge, and adoption (Murage et al., 2016).

Research (NALEP, 2011; Murage et al., 2016; Muatha, 2014; Kehinde & Adeyemo, 2017) shows field days are often used to disseminate information and are also ranked highly where interpersonal communication has been used to pass information to farmers. These studies (Akinsorotan, 2009; Girma et al., 2017; Kamau et al., 2018; Taw et al., 2018) have shown that field days were successful in changing farmer attitudes, increasing farmer knowledge, and enhancing adoption of innovative or new agricultural practices. Despite these studies, there is less evidence of research on the influence of farmer field days as a tool for disseminating agricultural research information among irrigated rice farmers at the Mwea Irrigation Scheme which accounts for 80% of all the rice produced in Kenya. This is a research gap that this study intends to contribute to.

1.3 General Objective

The general objective of the study was to examine the influence of farmer field days in communicating agricultural research information on the use of Topshot Herbicide among rice farmers at the Mwea Irrigation Scheme.

1.3.1 Specific Objectives

The study was guided by the following specific objectives;

i. To examine how farmer field days influence knowledge of Topshot Herbicide among rice farmers at the Mwea Irrigation Scheme.
ii. To determine how farmer field days influence attitudes towards Topshot Herbicide among rice farmers at the Mwea Irrigation Scheme.

iii. To assess how farmer field days affect adoption of Topshot Herbicide among rice farmers at the Mwea Irrigation Scheme.

1.3.2 Research Questions

The study had the following research questions;

i. How do farmer field days increase farmers' knowledge of Topshot Herbicide among rice farmers at the Mwea Irrigation Scheme?

ii. How do farmer field days influence farmers' attitude towards Topshot Herbicide among rice farmers at Mwea Irrigation Scheme?

iii. How do farmer field days affect farmers' adoption towards Topshot Herbicide among rice farmers at the Mwea Irrigation Scheme?

1.4 Rationale and Justification of the study

The current practice for weed control in rice fields is a combination of herbicide use and hand weeding. In normal practice, there are three sets of weed management which comprise herbicide application and two sets of hand weeding. One acre hand weeding requires 27 man days per acre per season when doing pure manual hand weeding. At the same time, labour in Mwea has become not only scarce but also expensive. It costs approximately Kshs 400/= per man day manual hand weeding during the cropping season. Use of herbicides for weed control in paddy fields is widely used in many rice growing countries. In Kenya, the use of herbicides for weed control in paddy fields is a relatively new phenomenon and very few products have so far been screened for efficacy. This study is timely as it could contribute to the understanding of the effects of the promotion of using herbicides among rice farmers at the Mwea Irrigation Scheme and in identifying the role of

interpersonal communication through FFDs to enhance adoption of innovative technologies and agricultural practices.

1.5 Significance of the Study

This study could be of importance to policy and decision makers in the agricultural sector as it could show the relevance and effectiveness of the interpersonal mode of sharing agricultural research findings information to farmers which can in turn contribute to enhancing food production in the country. The information from the study could be used to develop policies and strategies that ensure that timely, accurate, and reliable information reaches farmers. The study could be of importance to farmers at the Mwea Irrigation Scheme as their experience in farmer field days could be used to improve on the use of this channel to send and receive information on agricultural research to them, as well as other farmers across the country. The study also aims at being significant for researchers and scholars as it will contribute to the body of knowledge on farmer field days and interpersonal communication as a channel for agricultural information. The study will also suggested areas for further research on farmer field days and dissemination of agricultural research findings.

1.6 Scope and Limitations of the Study

This study was limited to the Mwea Irrigation Scheme. The study limited its investigation to influence of farmer field days on knowledge, attitudes and adoption in the objectives of agricultural technologies. Although the Mwea Irrigation Agricultural Development (MIAD) Centre provides agricultural research on other crops, this study limited its investigation to rice farmers. Furthermore, the study was limited to agricultural information from the MIAD Centre which has been disseminated through Farmer Field Days.

1.7 Operational Definition of Terms

Farmer Field Days Refers to events organized for farmers to interact, experience, and for demonstration of new innovations in agriculture (Singh et al., 2018). In this study, farmer field days refer to events by the Mwea Irrigation Agricultural Development Centre (MIAD) to demonstrate and disseminate agricultural research findings to rice farmers at the Mwea Irrigation Scheme.

Knowledge Refers to skills and experiences gained based on exposure to new or emerging technologies (Kamau et al., 2018). In this study, knowledge refers to the skills and experiences that farmers have obtained from participating in the Mwea Irrigation Agricultural Development (MIAD) Centre farmer field days.

Innovation This is the procedure of translating an idea that is received as novel by a person or other adoption unit (Rogers, 1995). In this study, innovation refers to the new method of weed control introduced to rice farmers at the Mwea Irrigation Scheme.

Adoption This is the outcome of a personal or organization to use an innovation (Kundu & Roy, 2011). In this study, adoption refers to the uptake of new or emerging agricultural technologies by rice farmers at the Mwea Irrigation Scheme.

Attitude Refers to a person's evaluation of any object as a response towards being unfavourable and favourable to an object, innovation, person, institution or event (Nazuri, Man, Saufe, Nazuri, 2018). In this study,

attitude refers to the response of farmers at the Mwea Irrigation Scheme towards the field days carried out by the Mwea Irrigation Agricultural Development Centre (MIAD).

CHAPTER TWO: LITERATURE REVIEW

2.0 Overview

This chapter provides a review of literature for this research. The chapter is presented in sections of the theoretical framework, research gap, and both empirical and general literature based on the research objectives of the study.

2.1 Farmer Field Days and Knowledge of Agricultural Innovation

There is evidence of the influence of FFDs on the knowledge of farmers and this information is provided in this section. The empirical studies are presented in terms of the global, regional, and local context. In the United States, Haub and Stevenson (2017) assessed the use of FFDs to promote improvement of Iowa's water and soil quality through education about conservation farming practices. The findings indicated that thirty percent of farmers agreed that lack of knowledge was a hindrance to adopting conservation practices whilst the majority of participants in the field days rated them as excellent or good. The results also showed that the interpersonal interaction of field days was preferable to farmers seeking instruction and knowledge.

In Ghana, Okorley, Adjargo, and Bosompem (2016) studied on the potential of farmer field school (FFS) in cocoa extension delivery. The study used a retrospective (reflexive) comparison design which was adopted to compare the FFS program participants to them, before (pre-test) and after (post-test) the intervention among a sample of 215 cocoa FFS participants. The findings indicated that FFS were effective in creating an atmosphere where farmers' knowledge acquisition coca technologies exhibited in FFS.

In Nigeria, Akinsorotan (2009) conducted a study on the impact of field day on oil palm farmers' knowledge among a sample of 132 participants, a sample of 64 farmers were

engaged in the demonstrations from different states and out of which 34 farmers were selected randomly for evaluating and measuring the impact of the field days based on the knowledge they gained. Using t-tests to compare the results on knowledge gained, results revealed that there was a big change in the knowledge scores of cultivation of palm oil among the farmers after and before engagement in the FFDs.

In Uganda, Girma et al. (2017) assessed farmers' knowledge and intent to adopt push-pull technology to control Striga and cereal Stemborers based on a field day experience. The study utilized cross-sectional data collected during on- spot surveys conducted in 2014 and 2015 across seven districts of Uganda. 849 respondents, 474 in 2014 and 375 in 2015 participated in the study. The effectiveness of field days during 2015 was considerably improved due to the improved training packages hence willingness to adopt or continue the technology uptake was significant.

Still in Uganda, Kamau et al. (2018) evaluated the effect of field days and demonstration plots on the knowledge, awareness, and used of an enhanced maize variety. A quasi-experimental design was adopted in which the design was used to evaluate the changes in the adoption behaviour of farmers and the impact on productivity. The results indicated that there was no change on the number of farmers that planted the promoted maize variety and the acreage of size of land planted with the variety that was promoted through the field days. The findings also indicated that knowledge and awareness of farmers on the variety was still low. The results suggested that FFDs had no effect on knowledge of farmers on the maize variety that was being promoted.

In Kenya, Muatha (2014) assessed the awareness of farmers on agricultural extension preferences and devolution among participatory design of programs on agricultural

extension. The study was conducted among a sample of 288 respondents from Meru County who were small scale farmers. A binary logit model was employed to assess the possible determinants of the level of farmer awareness of agricultural extension devolution. The findings indicated that farmer field days attendance was important in influencing awareness among farmers on extension devolution.

2.2 Farmer Field Days and Attitude towards Agricultural Innovation

In Australia, Kilpatrik (2000), conducted a study on education and training among farmers which aimed to examine the impacts on farm management practice. The study relied on secondary data and found that FFS and Field days had a positive effect on farmer attitudes. This interaction assists in altering values and attitudes toward new practices.

In Myanmar, Taw et al. (2018) analysed the roles of agricultural extension agents in hybrid rice technology decision-making process of farmers. This study used survey and interview research design where open and closed questionnaires were used to collect data from two hundred and forty nine extension officers working in extension services using descriptive statistics to define the background features of extension officers and experience on hybrid rice and their roles on hybrid rice production. The study found that field days were the second most used extension method to change the attitudes of farmers to adopt the innovation.

In their study of five nations in the Eastern And Southern African (ESA) region, Anandajayasekeram, Davis, and Workneh, (2007) found that FFDs had influenced a change in perception and attitudes of participants and had motivated the creation of new relationships between extension workers, researchers, farmers, and community development

officers. The evaluation and monitoring of the farmer field days showed that there was an increase in the interaction among the stakeholders.

In Kenya, Maina et al. (2012) analyzed the benefits and costs of implementing a farmer field school for tea farmers and the study adopted a cross sectional research design in which five hundred and fourteen tea farmers on a small scale were selected into the sample from The Kenya Tea Development Agency (KTDA) factories. The data was quantitatively analyzed from which it was found that gaining knowledge, problem – solving skills, better attitudes among the farmers empowered the farmers while the facilitator who were professionally trained were confident in sharing their experience, skills, and knowledge.

2.3 Farmer Field Days and Adoption of Agricultural Innovation

In the United States, Singh et al. (2018) studied the influence of field days and demonstration practices on adoption of conservation practices by evaluating the interaction between demonstration sites and field days and the attendance of producers in a four-day conservation practice demonstration using personal interviews and mail survey in Indiana. The findings indicated a positive association between adoption of cover crops, filter strips, nutrient management and attendance supporting the idea that field days supported adoption of conservation practices.

In Syria, Yigezu et al. (2018) studied the improvement of adoption of agricultural technologies that required a great initial investment among small scale farmers. The duration analysis and hurdle model was applied among a sample of eight hundred and twenty barley and wheat producing households. The findings of the study indicated that an increase in awareness and exposure of zero tillage technology via demonstration trials and field days

which was also complemented with giving free access to costly zero tillage seeders and this had an impact on increases speed, propensity, and intensity of utilization.

In Tanzania, Mustapha (2017) assessed the impact of extension approaches for improving common bean technologies amongst small scale farmers. A quasi-experimental survey was used and household questionnaires were administered to 200 respondents selected through multi-stage sampling techniques. The Tobit Regression Model was adopted to evaluate the impact of different extension approaches in scaling up small scale farmers adoption, willingness, and awareness of ICT. The results indicated that field days were not effective in increasing farmers' intention to use the improved common bean technologies in the study area.

In Malawi, Tegha (2014) evaluated the effect of field days on the promotion of adopting and recommending promoted maize varieties among small scale farmers in Lilongwe. The sample for the study was 60 farmers in areas where field days had been executed. The information was gathered using personal interviews which revealed that the field days contributed to the promoting and utilization of enhanced maize variety. The participants had the ability to learn new information on the enhanced maize varieties and the participants also showed interest in planting the promoted maize variety.

In Tanzania, Nyamonge (2016) conducted research on the function of FFS in adaptation and adoption of promoted rice production techniques by using the cross-sectional research design in a sample that comprised of one hundred and eight selected using multi-stage sampling approach. The findings of the study indicated that fifteen promoted rice production practices were introduced on FFS in the study and indicated that seventy five percent showed awareness and the majority of the participants recommended rice the

promoted rice production techniques with sixty five percent of FFS members adopting the promoted rice production.

In Kenya, Njeri and Mberia (2019) studied the effect of group interpersonal communication methods on adoption of organic farming among maize farmers in Machakos County. The study adopted a descriptive research design which targeted 910 maize farmers and their trainers in the Machakos County region. Correlation and regression analysis was used to determine the relationship between FFS and adoption. The study found evidence that group interpersonal communication had a significant impact on adoption of organic farming. The findings suggest that use of FFS among farmers promotes adoption of agricultural innovations.

Still in Kenya, Mugo et al. (2013) examined the determinants on conservation agriculture adoption as a strategy for adapting to climate change in Nakuru County from a sample of 120 small scale farmers selected via proportionate random sampling. The findings of the study revealed that the number of times a farmer had participated in field days had a positive and significant effect on adoption of conservation agriculture.

2.4 Theoretical Framework

2.4.1 Diffusion of Innovation Theory

Rogers is associated with the Diffusion of Innovation Theory (DoI) and introduced it in 1962 and was founded in the communication discipline and its aim was to describe how, over time, a product or idea diffuses and gains momentum in a group of people of social system. The outcome of this diffusion is that people who are a part of a social system adopt a product, behaviour, or idea. Adoption refers to an individual doing something in a different way than they did before. Adoption of a new behaviour, idea, or product does not occur

concurrently in a social system; rather it is a procedure where some people are more leaning towards adoption of an innovation than others (Akça1 & Özer, 2014).

There are five categories of adopters where early adopters are those that are grouped as opinion leaders who embrace variation chances and enjoy leadership roles and have awareness of the requirement to change and they are confident in adoption of new ideas. The techniques to reach this population consist of information sheets and how-to manuals on execution. This group of adopters does not require data to influence them to change. The early majority is seldom leaders but they adopt new ideas before other normal people. This group of people requires observing evidence that the technology is working before they are ready to adopt it. These strategies to reach this group include evidence and success stories of the effectiveness of the innovation (Avolio, Blasi, Cicatiello, & Franco, 2014).

The late majority group does not trust change and will only utilise an innovation after it has been used by the early majority. The techniques to reach this population include information on how other people have adopted and used it successfully. The group of laggards is those that are conservative and tied down by tradition. They are a unique group and are the most difficult to accept the innovation. The techniques to petition this population are pressure, fear appeal, and statistics from others in the groups that have adopted (Avolio et al., 2014).

Rogers (1983) identifies five characteristics for successful adoption within the theory of DOI: relative advantage, complexity, compatibility, trialability, and observability. According to Rogers (2003), relative advantage refers to the degree to which a new idea is seen as better than the idea in use before introduction. Compatibility refers to when a technology is observed as being matched with the needs of potential adopters, past

experiences, and existing values. Complexity is the degree to which a technology is observed as hard to use and understand. Triability is the extent to which a technology can be tried on a small scale. Observability is the extent to which the outcome of a technology can be seen by others (Sahin, 2006).

There are other factors that are also important in the adoption of an innovation. Rogers (1983) model describes the determinants of innovation by twenty attitudes collected in five groups. Creating an attitude towards innovation is the motive for denial or either approval of innovation. These indicators are perceptual indicators, subjective which varies among persons. The application of these variables means that the speed of diffusion of innovation will be accelerated more. These determinants are innovative, individual, environmental, task, and organizational factors.

The personal factors describe to the insight of the possible adopter in information system as a substantive factor of adoption information. Personal attitude towards an innovation influences denial or adoption. The decision to adopt means that an innovation will be applied (Akça1 & Özer, 2014). Organizational factors comprise of interpersonal networks, technological experience, and exchange of information through informal and unplanned between people. Task factors consist of commercial advantage, user satisfaction, and user resistance. The successful transfer of innovation is also dependent on environmental factors which consist of technological infrastructure, cultural values, and community norms. The innovative factors consist of the relative advantage, complexity, compatibility, trialability, and observability (Akça1 & Özer, 2014).

Therefore DOI theory also involves an innovation decision process which Rogers (2003) describes as an information seeking and information processing activity where an

individual is motivated to reduce uncertainty about the advantages and disadvantages of an innovation (Sahin, 2006). This process involves the Knowledge Stage where the existence of an innovation is communicated to an individual and the details of how it works are explained, this is followed by the Persuasion Stage where the individual forms an attitude towards the innovation, positive or negative, followed by the Decision Stage where the individual chooses whether to adopt or not to adopt the innovation, this is followed by the Implementation Stage where the individual puts the innovation into practice and finally comes the Confirmation Stage where an individual looks for assurance about their decision to implement the innovation introduced to them (Sahin, 2006)

There are several criticisms (MacVaugh & Schiavone, 2010) that have been advanced on the applicability of the DOI. The DOI has been criticised on focusing too much on the individual rather than the other factors in the system that can influence decision to adopt an innovation. The theory also assumes that there are no differences brought about by socio-economic status differences among members of a social system. Moreover, the theory focuses too much on the product and innovation and does not take notice of the complicated economic, cultural, technological and other determinants how the product is adopted in a social system. Despite these criticisms, the DOI theory is useful for this study as it focuses on the importance of interpersonal contact and communication between extension agents or research organisations and the farmers. Interpersonal communication is also important within the social system – rice farmers – and this influences their decision to adopt an innovation. The theory has also been used by previous studies (Cheboi & Mberia, 2014; Njeri & Mberi, 2015) on adoption of innovation among farmers.

2.5 Research Gap

The evidence shows that research has been conducted on relationship between FFDs and adoption of agricultural information. These studies have been conducted from a global, regional, and local context. The studies have focused on different aspects of agricultural innovations and practices. Ochienno (2014) found that frequency of communication between farmers and extension agents was a significant communication factor affecting adoption of SRI among the Mwea Irrigation Scheme farmers. Others include Akinsorotan (2009) who conducted study on the impact of field day on oil palm farmers' knowledge in Nigeria, Girma et al. (2017) study on farmers' knowledge and intent to adopt push-pull technology to control Striga and cereal Stemborers based on a field day experience in Uganda, Kamau et al's (2018) research assessment on the impact of field days on farmers' awareness, knowledge of improved maize varieties in Uganda, Taw et al. (2018) analyzed the roles of agricultural extension agents in hybrid rice technology decision-making process of farmers using field days. Despite this evidence, there is less empirical research that has focused on the effectiveness of FFDs on adoption of Topshot Herbicide to control weeds in the paddy fields of Mwea Irrigation Scheme. This is a research gap that the study intends to fill.

CHAPTER THREE: RESEARCH METHODOLOGY

3.0 Overview

This chapter presents the flow and logical process through which the study was conducted. The research techniques that were used in the study are also introduced, discussed, and the justification for their selection is given. The chapter consists of research design, research site, target population, sampling technique and sample size, data collection methods, data collection procedures, and data analysis and presentation.

3.1 Research Design

Kothari (2004) described a research design as a concept structure in which a research is done and it involves the plan for analysis, collection, and measurement of data (Kothari, 2004). The research design is thus a strategy, structure, and plan of a research to establish the different techniques to answer the problems and to reduce the changes (Kothari, 2004). This definition means that a research design is the general plan for conducting research and involves selection of tools and techniques to collect, sample, and analyze data. The researcher used the descriptive research design. A descriptive research is a set of information collected without changing its environment. Descriptive research involves researchers interacting with the participants and carrying out surveys or interviews to gather the necessary information (Leedy & Ormrod, 2005). The descriptive design was suitable for this study as it sought to interview farmers and gather information on their experiences in an effort to understand and explain use of FFDs communication of agricultural research information.

3.2 Research Site

The research site of the study was in the Mwea Irrigation Scheme which is one of the seven public schemes that are under the purview of the National Irrigation Board (NIB). The scheme is located in Kirinyaga South Sub County in Kirinyaga County which is situated 100 KMs North East of Nairobi. The scheme covers 30,350 acres in which 16,000 of it is under paddy production. The scheme also has 4,000 acres of jua kali/out grower areas that are under paddy production and the rest is for subsistence, horticultural production, public utilities, and settlement (NIB, 2018). Figure 3.1 shows the location of Mwea Irrigation Scheme.

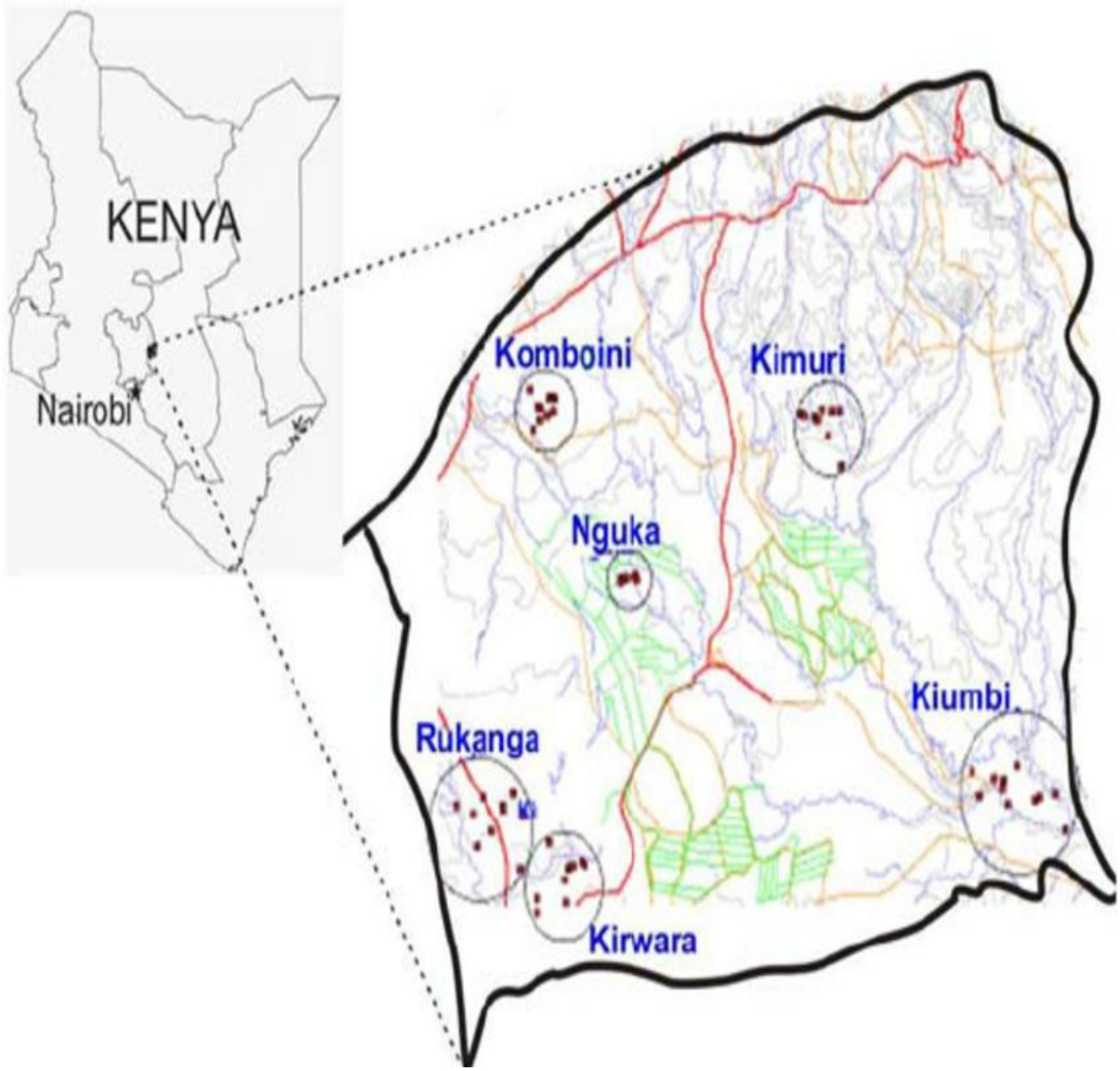

Figure 3.1 Mwea Irrigation Scheme

3.3 Target Population

A target population is the complete list of subjects whose features are of importance to a research study (Martínez-Mesa et al., 2016). The target population of the study was rice farmers who participated in the Topshot Herbicide demonstration on irrigated paddy fields weed control at the Mwea Irrigation Scheme on the 7th, 8th, and 9th November, 2018. The

target population was 524 participants from the Topshot Demo Report (2018) from MIAD Center.

3.4 Sampling Technique and Sample Size

The process of selecting sampling units and persons from a sampling frame is defined as sampling. The strategy of sampling requires that the needs of a research be listed early as the sampling approach can influence the estimation of a sample size (Martínez-Mesa et al., 2016). On the other hand, the sampling frame is the selection of units or individuals that can be chosen from a target population using a process of sampling. The sampling frame was a list of farmers that participated in the Topshot Herbicide demonstration on paddy fields weed control in Mwea Irrigation Scheme. Mugenda and Mugenda (2019) recommend that an adequate sample size can comprise selection of 10 – 30 % of a population. In this case, the researcher selected 30 % of the target population to represent the sample size of the study as 157 respondents as shown in Table 3.1.

Table 3.1 Sampling frame

Farm	Population	Sample Size
1 Mwea	121	36
2 Tebere	112	33
3 Karaba	92	28
4 Wamumu	101	30
5 Ndekia	98	30
Total	**524**	**157**

In order to select a proportionate number of respondents from each of the farm, the researcher used proportionate probability sampling where the population of each farm was divided by the total population and multiplied by the sample size as shown in Table 3.1. Simple random sampling was used to select and identify the respondents for the sample size. This approach is appropriate for this study as the researcher had access to the sampling frame

which allowed the interviewer to randomly select respondents from this list. The four steps of simple random sampling are defining the population, constructing a list of all members, drawing the sample, and contacting the members of the sample (West, 2016).

3.5 Data Collection Methods

The research used primary data to gather field information which refers to information that is collected first hand by a researcher for a specific study. Questionnaires were used to collect primary data.

3.5.1 Questionnaires

The questionnaire is an instrument of data collection that has a number of prompts and questions for the aim of collecting data from respondents. A questionnaire allows the investigator to gather the most accurate and complete information in a logical manner (Neumann, Neumann, & Hood, 2010). A semi-structured questionnaire was used to collect data and was designed into sections that manifested the three dependent variables: knowledge, attitude, and adoption towards agricultural innovations (Topshot Herbicide). The questionnaire was administered to farmers who attended the MIAD convened Farmer Field Days.

3.5.2 Interview Guide

The study conducted key informant interviews from agricultural officers who work with rice farmers in the scheme. A semi-structured interview guide was used to collect information from these participants using phone interviews. The interview is a critical technique of gathering data that consist of verbal communication between the subject and the researcher (Alshenqeeti, 2014).

3.6 Validity and Reliability of Research Instruments

3.6.1 Validity

The degree to which a data collection tool measures what it claims to measure is referred to as validity (Blumberg et al., 2005). The validity of the research instrument was established by using past studies and literature to develop constructs and statements on influence of field days on farmers' attitude, knowledge, and adoption of agricultural innovations (Topshot Herbicide). The researcher moreover consulted professionals, lecturers, and colleagues on the suitability of items developed for the research instrument.

3.6.2 Reliability

The degree to which a data collection tool gives steady outcomes with similar values is defined as reliability (Blumberg et al., 2005). Reliability measures repeatability, precision, trustworthiness, and consistency of a research (Chakrabartty, 2013). The concept of reliability is used to measure the strength of indicators used at different times to the same group of people and the similarity of sets of questions from the same tool (Kimberlin & Winterstein, 2008). The improved reliability performance means that the results are more accurate which increased the opportunities for making correct decisions in research.

To determine the reliability of the instrument, Cronbach Alpha was used to measure the internal consistency of the instrument part designed in 5 point likert scale. This method is more popular to determine reliability of instruments that use Likert scale items. A general accepted rule is that Cronbach Alpha values of 0.6-0.7 indicates an acceptable level of reliability, and 0.8 or greater a very good level (Ursachi et al., 2015). Therefore, this study aimed to achieve a value of more than 0.6. A pilot study was conducted among 15 respondents in order to determine the reliability and validity of the instrument. Hertzog

(2008) recommends that a sample size of 10-40 respondents as being adequate for a pilot study.

3.7 Data Collection Procedures

The researcher obtained a letter of authorization from the university to begin the data collection process. After acquiring the authorization, the researcher paid a visit to the Mwea Irrigation Agricultural Development (MIAD) Centre for introduction and to seek permission to collect data from the MIAD Centre agricultural officers, as well as rice farmers who have participated in FFDs conducted by the Centre at the Mwea Irrigation Scheme. A pilot study was done to determine the reliability of the instrument among 5 rice farmers. Any issues that arose during the pilot study were corrected and the final field work was done with the modified instrument.

Just like all scholars across the world, the researcher was faced with the challenge of the COVID-19 Pandemic which resulted to a change in the data collection process after the initial introduction visit. The President of Kenya, H.E Uhuru Kenyatta announced COVID-19 containment measures that included the cessation of movement in and out of the Nairobi Metropolitan in April, June and July 2020, hence posing a challenge to the researcher in terms of physically going to the Mwea Irrigation Scheme for the actual data collection process.

As a result, the researcher used a third party to conduct the data collection at the Mwea Irrigation Scheme. Through personal networks, the researcher engaged a research assistant to administer the questionnaires to the sampled respondents. The research assistant was sensitized on the objectives of the study and its overall purpose through emails, phone calls and video sessions through the online meeting App Zoom. The research assistant kept in

touch with the principal researcher in the six and a half weeks of data collection, giving regular updates on how the process was going.

Due to the additional COVID-19 restrictions announced by President Kenyatta in July 2020, that prohibited any gatherings of more than 15 people at a time, and a nationwide curfew of between 7PM and 4AM at the time collecting this data, the researcher advised the research assistant to administer the questionnaires in batches. This required an additional 4 weeks which prolonged the data collection process to about 2 months as both the principal researcher and the research assistant were also keen on adhering to the Ministry of Health's COVID-19 guidelines on social/physical distancing and staying indoors as much as possible, at the time of collecting this data.

Nonetheless, despite the COVID-19 challenge, the research assistant managed to access the required threshold of respondents, most of who live near and around the Mwea Irrigation Scheme. The batch of questionnaires administered to the respondents was sent back to the principal researcher in a bound parcel to be analyzed. The research assistant provided contacts of two other agricultural extension officers who were involved in the FFDs, they were interviewed by phone and the conversations transcribed for analysis.

3.8 Data Analysis and Presentation

Data analysis is the processing stage and includes the editing, coding, classification and tabulation of collected data that are ready to analyze. The processing of questionnaires involves identifying the questionnaires that are useful and those that are not. The editing of the questionnaires consisted of conducting careful scrutiny of all collected questionnaires to produce completeness, error-free documents and readability. The next stage was coding which involved assigning codes (numbers) for each category of answers from where the data

was entered into statistical software for the quantitative data. The Statistical Package for the Social Sciences (SPSS) was used to analyze the data using descriptive and inferential statistics. Descriptive statistics (mean, frequencies, and percentages) explain the numerical data. The secondary data was analyzed using content analysis. Content analysis is the process of organizing information into categories related to the central questions of the research (Bowen, 2009). Data from the questionnaires was presented in tables and charts and was supported by interpretation from the researcher.

3.9 Ethical Considerations

There are several ethical considerations that the study upheld in conducting this research. First, the confidentiality of the information shared with this researcher from the respondents was kept under lock and key by the research assistant and principal researcher and was only accessed by a data analyst. Anonymity of the study participants was guaranteed. The researcher had a list of farmers that participated in the field days, however, the respondents were not asked to indicate or share any personal identification information on the instruments. The voluntary nature of this research was enforced as respondents were asked for their verbal consent to participate in the study. The researcher ensured respondents understood that they can agree or disagree to participate in this study. To increase chances of participation, the researcher prepared an information sheet that detailed the purpose and objectives of the study.

CHAPTER FOUR:DATA ANALYSIS AND INTERPRETATION

4.1 Introduction

The data was analyzed using descriptive statistics that consisted of frequency distribution and mean, and is presented in this chapter. The chapter is presented in sub-sections that consist of study's response rate, rice farmer background information, knowledge, attitudes, and adoption of Topshot Herbicide, rice farmer attitudes towards Topshot Herbicide, relevance of Topshot Herbicide, motivation for Topshot Herbicide adoption, challenges of Topshot Herbicide adoption, and recommendation of Topshot Herbicide to other farmers. The data is presented in tables and supported with interpretation from the researcher.

4.2 Response Rate

The research was able to achieve a response rate of 74.5 % out of the 157 questionnaires administered to respondents, where the researcher was able to get back 117 questionnaires. The researcher also targeted 7 key informants in the study and was able to reach 6 of them, representing a response rate of 85.7%. The overall response rate for both the questionnaires administered to the respondents and the key informant interviews was 80.1% which fits the minimum threshold to be included in the data analysis as described in Table 4.1.

Table 4.1 Response Rate from Questionnaire

Response from Questionnaire	**Questionnaires**	**Key informant interviews**
Selected respondents	157	7
Respondents who completed	117	6
Respondents who did not complete	40	1
Response rate	**74.5%**	**85.7%**

4.3 Background Information

The age, marital status, gender, level of education, years of experience in farming, size of land, and sources of information were the demographic information that the study sought to describe the sample of the study.

4.3.1 Age

The age distribution of the rice farmers sampled shows that the majority of the sample was in the 40-49 years group as indicated by 48.7 %, with the second largest group being in the 50-60 years age bracket as represented by 35.9 %, while the least group of respondents were in the 20-09 years age group as shown by 5.1 %, as seen in Table 4.2.

Table 4.2 Age distribution among respondents

Age groups	Frequency	Percent
20-29	6	5.1
30-39	7	6.0
40-49	57	48.7
50-60	42	35.9
Over 60	5	4.3
Total	**117**	**100.0**

The findings go against those of Mburu's (2019) study on work related injuries and ill-health among farm workers at selected public irrigation schemes in Kenya, who found that majority of farmers were in the 21-35 year age bracket, followed by those in the 40-60 year age bracket.

Further discussion with a key informant on the age variations revealed that:

> *"The age of farmers at the scheme range depending on their family history and interests in the scheme. We have older farmers at the scheme who have been farming for very many years since the scheme was started, and who prefer to manage the farms themselves as a long time tradition, compared to*

the few who are becoming more receptive and leaving the farm management to their younger children or relatives."

4.3.2 Marital Status

The results on the marital status shows that the majority of respondents were married as shown by 89.7 %, 6.0 % were widowed, and 4.3 % were single as shown in Table 4.3. The findings agree with those of Nzonzo (2016) on information communication technologies adoption in irrigated rice production at the Mwea Irrigation Scheme, which showed that majority of farmers at the scheme were married followed by those who were single and widowed. Bello-Bravo et al. (2011) established that marital status played a role in the participation of women in Farmer Field Schools (FFS) in West Africa. A woman's age and marital status are important factors that will exert an important influence over female participation in FFS. The study found that older and more established (married) women in the community are encouraged by the chief to participate and these results agree with those of this research.

Table 4.3 Marital status among respondents

Marital Status	**Frequency**	**Percent**
Single	5	4.3
Married	105	89.7
Widowed	7	6.0
Total	**117**	**100.0**

4.3.3 Gender

Majority of the farmers were male as represented by a sample of 74.4 % with females representing 25.6 % of the sample as illustrated in Table 4.4. The findings disagree with those of Murage et al. (2019) who found that in Kenya, there were more female farmers attending field days (53.2%) compared to men (46.8%) in his study on gender

appropriateness of field days in knowledge generation and adoption of push-pull technology in Eastern Africa. The variation however could be because of the difference in the type, scope, subjects and time of carrying out the two studies. Gender-based constraints and socio-cultural barriers may exclude women from participating effectively in agricultural demonstrations either as participants or as hosts. Specific types of gender-based constraints that limit women's participation in field demonstrations include access to and control over productive resources and services, limited mobility, time constraints, and language barriers (Adam, Kandiwa, & Muindi, 2019).

Table 4.4 Gender distribution among respondents

Gender	Frequency	Percent
Male	87	74.4
Female	30	25.6
Total	**117**	**100.0**

4.3.4 Level of education

Table 4.5 shows the levels of education cited among respondents, 70.9 % of the sample had a secondary school level of education, 12.0 % having a primary school level of education, and 8.5 % having a university and college certificate/diploma level of education respectively. This finding supports that of Mburu (2019) who also found that the majority of rice farmers in Mwea had a primary school level of education followed by those with a secondary level of education with the least group having a university level of education.

Table 4.5 Educational levels among respondents

Levels of education	Frequency	Percent
University education	10	8.5
Secondary Education	83	71.0
College Certificate/Diploma	10	8.5
Primary education	14	12.0
Total	**117**	**100.0**

4.3.5 Years of experience in farming

In terms of the years respondents had been farming, the results show that most rice farmers had more than 15 years' experience as shown at 53.8 % followed by those with 6-10 years' experience represented at 28.2 % as seen in Table 4.6. In terms of length of farming experience, Mburu's study (2019) on work related injuries and ill-health among farm workers at selected public irrigation schemes in Kenya found that a slight majority had a 5-10 years' experience followed by those with 20-30 years and the least having an 11-19 years' experience. However, this result could be attributed to the difference in the type, scope, and subjects of Mburu's study and the present study.

Table 4.6 Years of farming experience among respondents

Years of experience	Frequency	Percent
Less than 1 year	11	9.4
1-5 Years	10	8.5
6-10 years	33	28.2
11-15 years	63	53.9
Total	**117**	**100.0**

4.3.6 Size of land

The size of land was found to be mostly in the less than one acreage as shown by 44.4 %, followed by those with 1-5 farm acreage at 27.4 % as shown in Table 4.7. In terms of farm size, the findings contradict those of Mburu (2019) who found that most rice farmers had 1-4 farm acreage whilst this study shows that the majority had less than one acreage of farm. Discussion with a MIAD officer however revealed that most of the farmers at the Mwea Irrigation Scheme have been sub-dividing their land among their children and other relatives, hence reducing the land size each farmer currently owns to less than one acreage. The officer said:

"The demand for farming land at the scheme has been increasing, but the overall acreage of the scheme has been the same over the years (26,000 acres). Most elderly farmers have been sub-dividing their land to suit the needs of their younger family members. The Government of Kenya has initiated an expansion project for the scheme to increase the acreage under rice by another 10,000 acres so as to accommodate more farmers, but it is not yet clear whether this will reduce the ongoing sub-division of farming land at the scheme among family members"

Table 4.7 Size of land among respondents

Land size	Frequency	Percent
Less than 1 acre	52	44.4
1-5 acres	32	27.4
6-10 acres	7	6.0
11-15 acres	26	22.2
Total	**117**	**100.0**

4.3.7 Other Crops Grown on Farm

Figure 4.1 shows that majority of the farmers do not grow any other crops except rice. However, for those that grow other crops, the results show that 21.4 % intercrop maize, beans, tomatoes, and vegetables. 12% of the sample indicated intercropping tomatoes and maize, 5.1% intercrop onions and maize, 4.3 % answered growing potatoes, and 1.7 % grow maize alone.

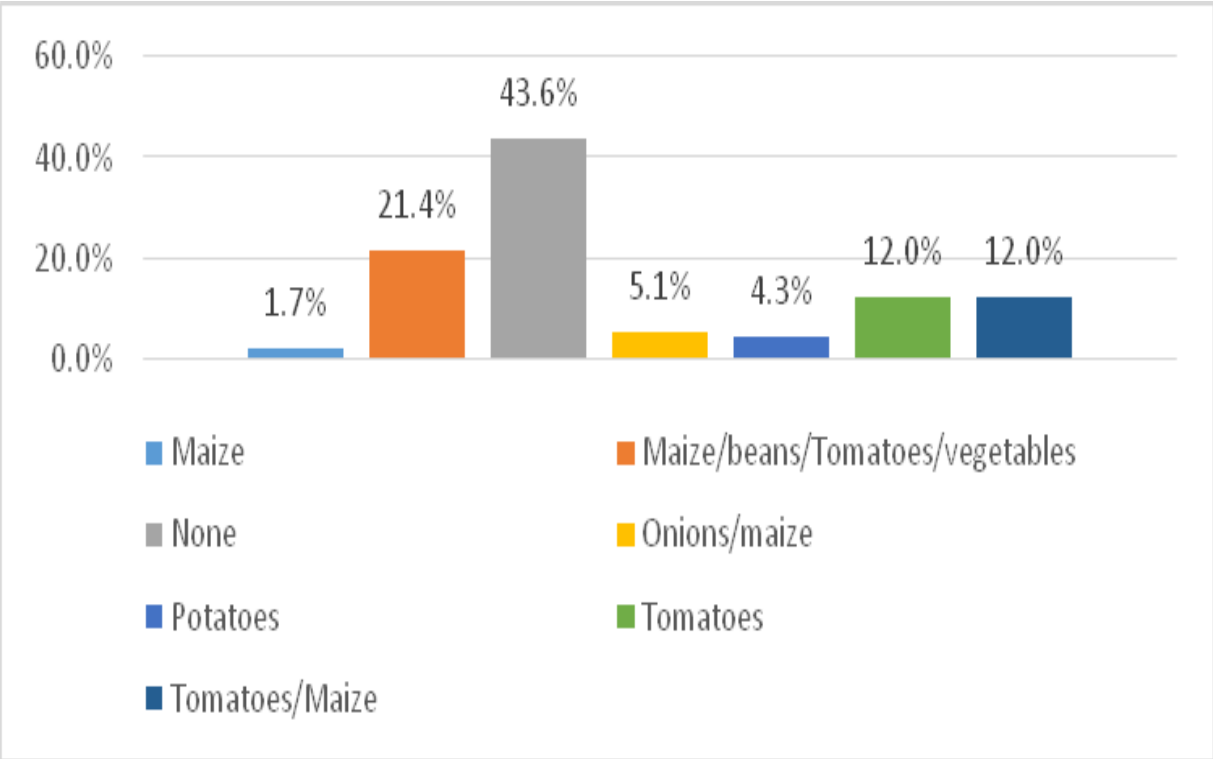

Figure 4.1 Other crops grown by farmers

4.3.8 Other Sources of Income

The findings revealed that 49.1 % of the respondents had an alternative source of income whilst 52.1 % cited having no alternative sources of income. The findings in Figure 4.2 shows that majority of the respondents received an alternative income from business (14.5%), 6.8 % indicated buying and selling rice, farm supervision, and MFI/SACCOs respectively. Formal employment was also mentioned as a source of income by 5.1 % and income from MIAD was also cited by 4.3 % of respondents.

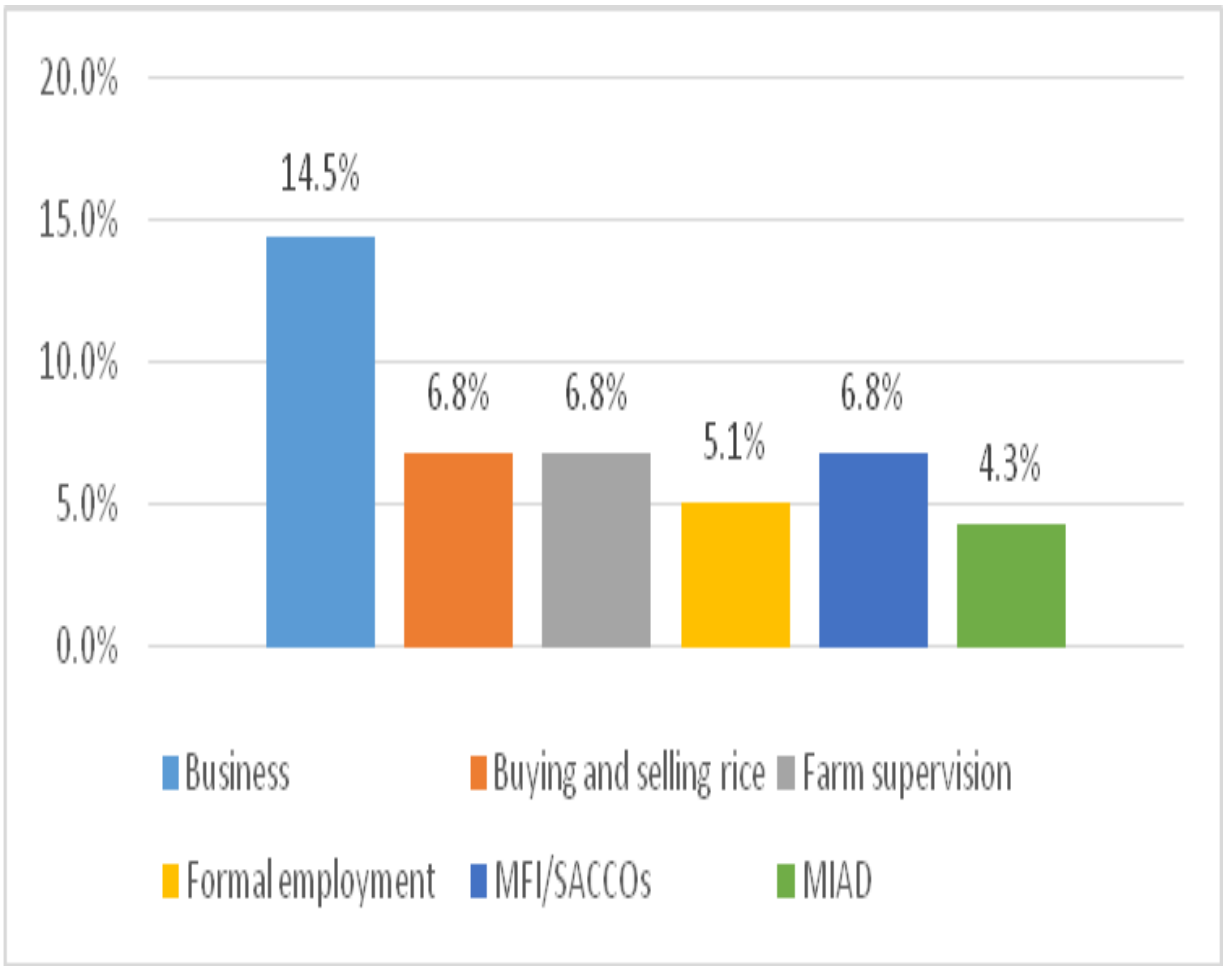

Figure 4.2 Farmers' alternative source of income

4.3.9 Sources of Information

The researcher was interested in knowing how rice farmers got information about Topshot Herbicide. Most of them cited getting information from the Mwea Irrigation Agricultural Development (MIAD) Centre as shown by 42.7 %, 17.9 % got their information from MIAD/Agrovet shop/other agricultural organizations/Media/Social media, 12.8 % received their information from MIAD/Media outlets. The least cited source of information of Topshot Herbicide was MIAD Centre/Agricultural Officers and MIAD Centre/Agrovet Shop sources as cited by 1.7 % respectively as depicted in Table 4.8.

Table 4.8 Sources of information on Topshot Herbicide

Sources	Frequency	Percent
Mwea Irrigation Agricultural Development (MIAD) Centre	50	42.7
MIAD/Agrovet Shop/Other farmers/Other agricultural organizations/Media/Internet	3	2.6
MIAD/Media outlets	15	12.8
MIAD Center/Agricultural Officers	2	1.7
MIAD Center/Agrovet Shop	2	1.7
MIAD Center/Media Outlets/Internet Social Media	3	2.6
MIAD/Agricultural extension officer/Agrovet Shop/Media/Internet	3	2.6
MIAD/Agricultural extension officer/Other farmers/Media/Internet	5	4.3
MIAD/Agrovet Shop/Other agricultural organizations / Media/Social media	21	17.9
MIAD/Agrovet Shop/Media Outlets	9	7.7
MIAD/Agrovet shop/Other farmers/Other agricultural organizations	4	3.4
Total	**117**	**100.0**

4.3.10 Ranking of Sources of Information

Table 4.9 shows the ranking of the sources of agricultural information among farmers which shows that the Mwea Irrigation Agricultural Development (MIAD) Centre was the top ranked source of information, this was followed by agricultural extension officers, family members, relatives, friends, Agrovet shop, other farmers, other Agricultural Organization(s), media outlets, and the least ranked being internet and social media.

Table 4.9 Ranking on source of agricultural information

Source of agricultural information	Rank
Mwea Irrigation Agricultural Development (MIAD) Centre	1
Agricultural Extension Officer	2
Family Members, Relatives, Friends	3
Agrovet Shop	4
Other Farmers	5
Other Agricultural Organization(s)	6
Media outlets (Print, Broadcast, Online)	7
Internet and Social Media	8

4.3.11 Agricultural Information

The study was interested in finding out the importance of agricultural information to farmers and the results show that it was very important (80.3 %), extremely important (12.8 %), and important (6.8 %) as shown in Table 4.10.

Table 4.10 Importance of agricultural information to rice farmers

Agricultural Information Importance	Frequency	Percent
Important	8	6.8
Very important	94	80.4
Extremely important	15	12.8
Total	**117**	**100**

4.3.12 Farming Methods Information

Table 4.11 shows the farmers' responses to the importance of farming methods in which the responses indicate that it was very important (51.3 %), extremely important (40.2 %), and important (8.5 %).

Table 4.11 Importance of farming methods information to rice farmers

Farming methods information	Frequency	Percent
Important	10	8.5
Very important	60	51.3
Extremely important	47	40.2
Total	**117**	**100**

4.3.13 Frequency of Information on Herbicides and Weed Control

The study aimed to find out how often farmers received information on weed control and herbicides and the findings show that the most cited frequency was quarterly (29.9 %), followed by yearly (23.9 %), monthly (19.7 %), weekly (17.1 %), fortnightly (5.1 %), and daily (4.3 %) as shown in Table 4.12.

Table 4.12 Frequency of information receipt on weed control and herbicides

Receive Information	Frequency	Percent
Daily	5	4.3
Weekly	20	17.1
Monthly	23	19.7
Fortnightly	6	5.1
Quarterly	35	29.9
Yearly	28	23.9
Total	**117**	**100**

4.3.14 Farmer Source of Herbicide Information

Table 4.13 shows the results on the sources of information on herbicides among the farmers from which findings show that the most cited was the Mwea Irrigation Agricultural Development (MIAD) Centre (17.1 %), followed by Agrovet Shop (13.7 %), agricultural extension officer/other farmers/media (11.1 %), MIAD/Agrovet Shop (10.3 %), and MIAD/agricultural extension officer (8.5 %).

Table 4.13 Source of herbicide information among farmers

Source of herbicide information	Frequency	Percent
MIAD Centre	20	17.1
Agrovet Shop	16	13.7
Agricultural extension officer/Other farmers/Media	13	11.1
Agricultural extension officer	8	6.8
MIAD/Agrovet Shop	12	10.3
Agrovet Shop/Limazone/ Media/Social Media	7	6
Agrovet shop/Media/Internet	5	4.3
Other agricultural organizations / Pesticide manufacturers	6	5.1
MIAD/Agricultural extension officer	10	8.5
MIAD/Agricultural extension officer/Agrovet Shop	6	5.1
MIAD/Agricultural extension officer/Agrovet Shop/Media/Internet	3	2.6
MIAD/Agrovet Shop/Media Outlet/Social Media	3	2.6
MIAD/family members/relatives/friends	8	6.8
Total	**117**	**100.0**

4.3.15 Source of Herbicide Information Ranking

The farmers were asked to rank the sources of herbicide information and the results show that the highest rank was the Agrovet shop, this was followed by other farmers, agricultural extension officer, family members, relatives, friends, MIAD Centre, Other Agricultural Organizations, media outlets, and the least ranked was the Internet and social media as shown in Table 4.14.

Table 4.14 Farmer's ranking on Source of herbicide information

Source of agricultural information	Rank
Agrovet Shop	1
Other Farmers	2
Agricultural Extension Officer	3
Family Members, Relatives, Friends	4
Mwea Irrigation Agricultural Development (MIAD) Centre	5
Other Agricultural Organization(s)	6
Media outlets (Print, Broadcast, Online)	7
Internet and Social Media	8

4.3.16 Farmer Field Days Participated

The findings revealed that farmers had participated in different Farmer Field Days (FFDs) which ranged from the Mwea Irrigation Agricultural Development (MIAD) Centre coordinated FFDs (32.5 %), pest control/WSRC/mechanical farm/ water management (8.5 %), timing of herbicide application (8.5 %) as shown in Table 4.15.

Table 4.15 Farmer Field Days that Farmers had participated in

FFD participated	Frequency	Percent
CCS	6	5.1
Kathigiriri	5	4.3
MIAD	38	32.5
Pest control/WSRC/ Mechanical Farm/ Water management	10	8.5
Rice Mapp/Greenlife	4	3.4
Timing of herbicide application	10	8.5
Use of Herbicides/Best farming practices/Good use of fertilizers	2	1.7
Use of organic fertilizer	3	2.6
WSRC	6	5.1
Not Applicable	5	4.3
Missing responses	28	23.9
Total	**117**	**100**

4.3.17 Topshot Herbicide FFD Source of Information

Table 4.16 shows results on the sources of information on the Topshot Herbicide FFDs. The results show that MIAD centre (53.0 %), was the most mentioned source of information where farmers cited that MIAD are the organizers and coordinators of any information and knowledge regarding the use of Topshot Herbicide. The findings also show that farmers got the information through MIAD/mass media (14.5 %), MIAD/the internet (4.3 %), and also MIAD/media/internet (10.3 %).

Table 4.16 Source of information on Topshot Herbicide farmer field days

MIAD FFD Information	Frequency	Percent
Agricultural extension officer	4	3.4
MIAD centre	62	53.0
MIAD/Agricultural extension officer	9	7.7
MIAD/Agricultural Extension Officer/Media	5	4.3
MIAD/Internet	5	4.3
MIAD/Media	17	14.5
MIAD/Media/Internet	12	10.3
MIAD/Radio	3	2.6
Total	**117**	**100.0**

These findings were confirmed by an agricultural officer who cited the MIAD Centre as among the key sources of information about the FFDs concerning Topshot Herbicide. He said:

> *The approach was multipronged as the fact that the MIAD Centre set up Demonstration Plots in every corner of the expansive scheme was a platform to move with the farmers on the new technology (Topshot Herbicide). We also did a public address consecutively for a week before the actual field day, around the villages that these farmers come from, to invite them to the field*

day, and to remind those who had already heard about it to attend the field day.

The agricultural officer however also revealed that farmer leaders were instrumental in getting the information about the FFD to other farmers around the scheme. He added that;

When it was time for the FFD, since the MIAD Centre had already created awareness through other channels, it became easy to just use farmer leaders to mobilize other farmers and also use the same farmers who we were going along together to alert other farmers to attend the farmer field day.

4.3.18 Weed Control Methods

The findings show that chemical weeding (47.0 %), was the widely used practice of weed control. This was followed by manual weeding (26.5 %), push weeder (12.8 %), and a combination of chemical weeding/hand weeding (3.4 %), as seen in Table 4.17.

Table 4.17 Weed control methods used before Topshot Herbicide

Weed control method	Frequency	Percent
Chemical weeding	55	47.0
Chemical weeding/hand weeding	4	3.4
Hand weeding/Manual weeding	31	26.5
Push weeder	15	12.8
Missing responses	12	10.3
Total	**117**	**100.0**

4.4 Knowledge of Topshot Herbicide

In terms of knowledge of Topshot Herbicide, the farmers were asked to indicate their level of agreement on seven statements on a 5 point likert scale ranging from Poor (1) to Very Good (5). Table 4.18 shows that majority of the farmers indicated that their knowledge in applying Topshot Herbicide was very good (77.8%) they had very good knowledge on how to measure the herbicide and mix it (74.3%), were knowledgeable on the application

rates (73.5%) and its effects (94.9%) and were aware of the advantages (93.2%) and challenges (82.9%) of using Topshot Herbicide on their farms.

The findings suggest that participation in FFDs resulted in the knowledge of Topshot Herbicide which is an innovation in chemical weeding. The findings support previous global and regional studies that had a similar outcome. For instance, In the United States, Haub and Stevenson (2017) assessed FFDs use in promoting improvement of Iowa's water and soil quality through education about conservation farming practices which found that interpersonal, farmer-to-farmer presentation in farmer field days was preferred by farmers seeking knowledge and instruction.

Table 4.18 Table 4.18: Descriptive statistics on Farmers' Knowledge of Topshot Herbicide

Knowledge of Topshot Herbicide	**No**	**Poor**	**Average**	**Good**	**Very Good**
	knowledge				
I am knowledgeable in the measurement and mixing of Topshot Herbicide.	0	0	5	25	87
	0.00%	0.00%	4.30%	21.40%	74.30%
I am knowledgeable in the application of Topshot Herbicide	0	2	6	18	91
	0.00%	1.70%	5.10%	15.40%	77.80%
I am knowledgeable on the application rates of Topshot Herbicide	0	5	11	15	86
	0.00%	4.30%	9.40%	12.80%	73.50%
I am knowledgeable on the effects of application of Topshot Herbicide	0	0	2	4	111
	0.00%	0.00%	1.70%	3.40%	94.90%
I have knowledge on the advantages of using Topshot Herbicide in my farm	0	0	0	8	109
	0.00%	0.00%	0.00%	6.80%	93.20%
I have knowledge on the challenges of using Topshot Herbicide in my farm	0	0	13	7	97
	0.00%	0.00%	11.10%	5.90%	83.00%

The researcher interviewed extension officers who were asked if FFD participation contributed to knowledge on Topshot Herbicide. According to an extension officer;

> *The Farmer Field Days banked on physical demonstration of how to use the new Topshot Herbicide, meaning, the farmers could see it in action at that very moment and therefore it was easier for them to understand how it works and make a decision on whether it is good for their farms or not. At the time of the FFD, Topshot Herbicide was a new product in the market to enhance technology of managing weeds in rice farms. The FFD was very key in passing all the relevant information about Topshot to the farmers for the first time and getting it right was very important. Through the FFD, farmers were able to gather all the knowledge they needed about Topshot and even share with fellow farmers who did not attend the FFD. At the moment, Topshot Herbicide is the most sought after product in the market by the farmers because of the outreach that the centre did through the FFD to pass knowledge to the farmers on its existence and how to use it in their farms*

Moreover, Tegha (2014) who conducted an analysis on the usefulness of field days on promoting the adoption of recommended improved maize varieties by small holder farmers in Lilongwe, Malawi, established that field days conducted were found to contribute to knowledge on the improved maize varieties. In Kenya, Muatha's analysis (2014) on farmers' awareness of agricultural extension devolution result shows that, attendance to farmer field days is significant in influencing farmers' awareness of the extension devolution.

4.5 Farmers' Attitudes towards Topshot Herbicide

According to Rogers (2003), an innovation is an idea that is perceived as new by an individual. Newness of an innovation not only involves new knowledge, it includes people who have known about an innovation but not yet developed a favourable or unfavourable attitude towards it, nor adopted or rejected it. Thus, the study aimed to determine if FFDs had a contribution to farmer attitudes towards Topshot Herbicide as a new agricultural innovation.

Table 4.19 shows farmers' agreement with five of the statements on attitudes towards Topshot Herbicide which were ranked at a 5 point likert scale ranging from Strongly Disagree (1) to Strongly Agree (5). These statements were on the ability of Topshot to reduce costs of weeding practices where 84.7% of the respondents strongly agreed with the statement, 94.8% of the respondents affirmed its ability to contribute to an increase in the annual yield, 82.1% strongly agreed on its ability to get rid of weeds in the planting season, while 78.7% and 83.7% of the respondents agreed that Topshot Herbicide can control all weeds in their farms until harvest time and reduce the annual post-harvest losses respectively.

Table 4.19 Descriptive Statistics on Farmers' Attitudes towards Topshot Herbicide

Attitudes towards Topshot Herbicide	Strongly Disagree	Disagree	Moderately Agree	Agree	Strongly Agree
I believe the use of Topshot Herbicide will reduce the cost of weeding practices in my farm during planting season	0 0.0%	2 1.7%	7 5.9%	9 7.7%	99 84.7%
I believe the use of Topshot Herbicide will increase the annual yield of my farm	0 0.0%	1 0.9%	3 2.6%	2 1.7%	111 94.8%
I believe that use of	0	5	6	10	96

Topshot Herbicide will rid me of weed problems in my farm during planting season	0.0%	4.3%	5.1%	8.5%	82.1%
I believe that Topshot Herbicide will control all paddy field weeds up to the time of harvesting the crop	2 1.7%	5 4.3%	7 5.9%	11 9.4%	92 78.7%
I believe the use of Topshot Herbicide will reduce the annual harvest losses in my farm	0 0.0%	0 0.0%	7 5.9%	12 10.3 %	98 83.8%

The findings indicate that participating in FFD has a positive influence on their attitudes towards using Topshot to control weeds through chemical agents. These findings corroborate findings from earlier studies that found Farmer Field Days (FFDs) had a positive effect on attitude towards new agricultural innovations. For example, Kilpatrik's (2000) study on education and training among farmers which aimed to examine the impacts on farm management practice found that farmer field days had a positive effect on farmer attitudes as interaction from these demonstrations assisted in altering values and attitudes toward new practices. This was confirmed by an agricultural officer based at the Mwea Irrigation Scheme who acknowledged that;

> *The physical demonstration of how the herbicide works played a major role in the adoption process. From the demonstration at the Farmer Field Day, the farmers could see how effective Topshot is and that gave them an easier transition from the previous negative attitude towards new technologies, to a positive attitude of giving new technology a chance. The fact that the message about the new Topshot Herbicide came from a research centre (Mwea Irrigation Agricultural Development (MIAD) Centre) and relayed by agricultural extension officers, also helped in creating a positive attitude*

among the farmers who tend to trust the agricultural officers who have been helping them in various aspects in their farming activities over the years.

The results agree with those of Taw et al.'s research (2018) on the analysis of roles of agricultural extension agents in hybrid rice technology decision-making process of farmers in Myanmar. The study found that field days were the second most used extension method to change the attitudes of farmers to adopt the innovation. Kamau et al.s (2018) assessment of the impact of demos and field days in adoption and use of an improved maize seed found that there were changes in some aspects such as farmers' perception about the improved variety being promoted and found that female farmers' attitude towards agricultural innovation was much more influenced by participation in FFDs.

4.6 Adoption of Topshot Herbicide

The respondents were asked to indicate their level of agreement on statements on adoption of Topshot Herbicide which was ranked at a 5 point likert scale, ranging from Not at All (1) to To a Great Extent (5). Table 4.20 shows that there was agreement with five of the statements on adoption of Topshot Herbicide. The respondents agreed that they use Topshot Herbicide for weeding (72.6%) that they use Topshot Herbicide without seeking any assistance (63.2%) that they did not have to engage labour for hand weeding after using Topshot Herbicide (75.2%), and were more likely to recommend Topshot Herbicide to other farmers (76.9%).

The findings support other studies' findings that Farmer Field Day (FFD) participation resulted in adoption of agricultural technologies. These include Massimi's (2017) research in Jordan which showed that field demonstration contributed to significant adoption of chemical weeding among farmers thereby saving time and costs associated with weeding practices. In the region, Girma et al's study (2017) in Uganda assessed farmers'

knowledge and intent to adopt push-pull technology to control Striga and cereal Stemborers weed based on an FFD experience and found that effectiveness of FFDs was instrumental in the willingness of famers to adopt or continue the technology uptake.

Table 4.20 Descriptive statistics on adoption of Topshot Herbicide

Adoption of Topshot Herbicide	**Not at all**	**A little extent**	**Moderate extent**	**To some extent**	**To a great extent**
I use Topshot Herbicide for weeding purposes on my farm	11 9.4%	17 14.6%	0 0.0%	4 3.4%	85 72.6%
I recommend the use of Topshot Herbicide to other farmers for weeding in their farms	9 7.7%	13 11.1%	2 1.7%	3 2.6%	90 76.9%
I do not have to engage labour for hand weeding when I use Topshot Herbicide in my farm	10 8.5%	8 6.9%	6 5.1%	5 4.3%	88 75.2%
I will be using Topshot Herbicide from now onwards to deal with weeds in my farm	7 5.9%	14 12.0%	2 1.7%	11 9.4%	83 71.0%
I have successfully adopted Topshot Herbicide in my farm without any assistance	10 8.5%	13 11.1%	16 13.8%	4 3.4%	74 63.2%

In their study on the effect of group interpersonal communication methods on adoption of organic farming among maize farmers in Machakos County, Njeri and Mberia (2019) found evidence that group interpersonal communication had a significant impact on adoption of organic farming. The findings suggest that use of FFS among farmers promotes adoption of agricultural innovations in Kenya. Nambafu et al's research (2019) on knowledge, attitude and practices used in the control of Striga in maize by smallholder farmers of western Kenya recommended that increased use of farmer field days and demonstrations would contribute to full adoption of weed control techniques thus indicating the significance of FFDs on adoption of weed control techniques.When an agricultural officer was asked whether FFDs influenced adoption of Topshot Herbicide, he said;

> *Exclusively,Yes. It all comes down to the physical demonstrations done during the FFDs. The farmers who attended the FFDs began using Topshot Herbicide almost immediately depending on the cropping season and stage of their rice, while those that did not attend the FFDs took longer to accept the new herbicide and to understand how and at what stage of cropping it is used. The Centre had to organize another FFD for the famers who missed the first one to ensure they did not miss out on the benefits of the new technology on their farms.*

In regard to the extent to which farmers adopted the innovation after attending the FFDs, the key informant reckoned that;

> *To a large extent, Yes. Say about 70% of the farmers at the scheme now use Topshot Herbicide. 20% are still struggling to adopt it due to various reasons including level of education and age where some slightly older farmers trust the more traditional methods of weed control than new ones, and those with*

lower level of education also find it hard to understand how to use the herbicide. The remaining 10% are those that are not willing to adopt the use of the herbicide for reasons best known to them, despite having knowledge on how to use it.

4.7 Advantages of Topshot Herbicide

The results indicated that 90.6 % of respondents perceived that Topshot Herbicide was a better option of weed control compared to 2.6 % who said it was not. Table 4.21 shows the responses of farmers on this advantage. According to the findings, Topshot Herbicide was less expensive as mentioned by 22.3 % followed by gives good results and clears all weed as cited by 18.8 %. Other reasons given for the advantage of Topshot Herbicide was that it was most effective than hand weeding, and the lower costs of production associated with using Topshot Herbicide.

Table 4.21: Advantages of Topshot Herbicide

Advantage	Frequency	Percent
Chemical weeding is cheaper than hand weeding	10	8.5
I gained knowledge	4	3.4
Less money is used than before	26	22.3
Lower cost of production	6	5.1
Minimized time, labour, and supervision	2	1.7
Most effective herbicide	14	12.0
Topshot gives good results and clears all weed	22	18.8
Not applicable	33	28.2
Total	**117**	**100.0**

4.8 Motivation for Topshot Herbicide Adoption

Table 4.22 shows that the motivation for adopting Topshot Herbicide was killing all the weeds without leaving anything (17.1 %), followed by its ability to manage all types of weeds (13.7%), and facilitating saving of money (8.5 %).

Table 4.21 Descriptive statistics on Attitudes towards Topshot Herbicide

Motivations	Frequency	Percent
Because I use it once and for all	3	2.6
Increased yields	6	5.1
It is expensive	3	2.6
It is effective	9	7.7
Killing all the weeds without leaving anything	20	17.1
Less labour	5	4.3
Managing all types of weeds	16	13.7
Saved a lot of money	10	8.5
Work is done once	4	3.4
Not applicable	41	35.0
Total	**117**	**100.0**

4.9 Challenges of Topshot Herbicide Adoption

The study sought to find out the challenges facing farmers in their decision to adopt Topshot Herbicide. The results show that the major reason was that it was expensive (35.9 %), similarly, farmers also indicated financial constraints as a challenge to adopt Topshot Herbicide whilst other farmers indicated that Topshot Herbicide was associated with some health hazards as shown in Table 4.23.

Table 4.22 Descriptive Statistics on Attitudes towards Topshot Herbicide

Challenges	Frequency	Percent
Financial constraint	3	2.6
Health hazard associated	6	5.1
It is expensive	42	35.9
Low cost of production	4	3.4
Not applicable	62	53.0
Total	**117**	**100.0**

While the respondents gave the above answers as the reasons why adoption of Topshot Herbicide was a challenge, further investigation by the research through interviewing an agricultural officer revealed more reasons from an agricultural officer's point of view.

These challenges were categorized by the agricultural officer into groups that included;

Language Barrier *– Some farmers are quite aged and did not understand some of the scientific complexities of the new product, whose instructions are strictly in English. We had to adjust and include local translators in the FFDs to assist the farmers in interpretation. This could have slowed down the adoption rate.*

Age Barrier *– Older farmers had some level of resistance in adopting the new technology as they were used to one method of weed control (manual) through their many farming years. Some of them had a level of resistance trusting the younger generation who happened to be carrying out the FFD.*

Perception Barrier *– Some of the farmers at the scheme have been farming all their lives. They have been practicing traditional farming methods over the years and therefore persuading them to change and adopt new technology was an uphill task.*

Education Level Barrier *– Going hand in hand with the Language Barrier, farmers whose education level is lower had a difficult time understanding the use of the new Topshot Herbicide. Again, here, the local translators were very helpful."*

On whether the MIAD Centre was helping farmers in dealing with the challenges they were facing in the adoption of Topshot Herbicide, an agricultural officer stated that:

The MIAD centre is working closely with the farmers to provide extension services and get feedback on the challenges they are experiencing in the adoption of the new technology. We have agricultural officers who constantly visit the farmers to continue with the outreach and sharing of information about Topshot Herbicide. The agricultural officers also advice the farmers on what to do, and when to do it, to ensure they handle any arising issues in the best way possible.

The MIAD Centre is also accessible to famers who are allowed to come in and report any challenges they may have for further action by the agricultural officers.

The Centre also uses farmer leaders, who are farmers that are more advanced in terms of education, to help the other farmers in any issue related to the adoption and use of Topshot Herbicide.

4.10 Recommendation of Topshot Herbicide to other Farmers

Figure 4.3 shows that 88.0 % of farmers' interviewed would recommend the use of Topshot Herbicide to other farmers whilst a small sample representing 12.0 % answered no.

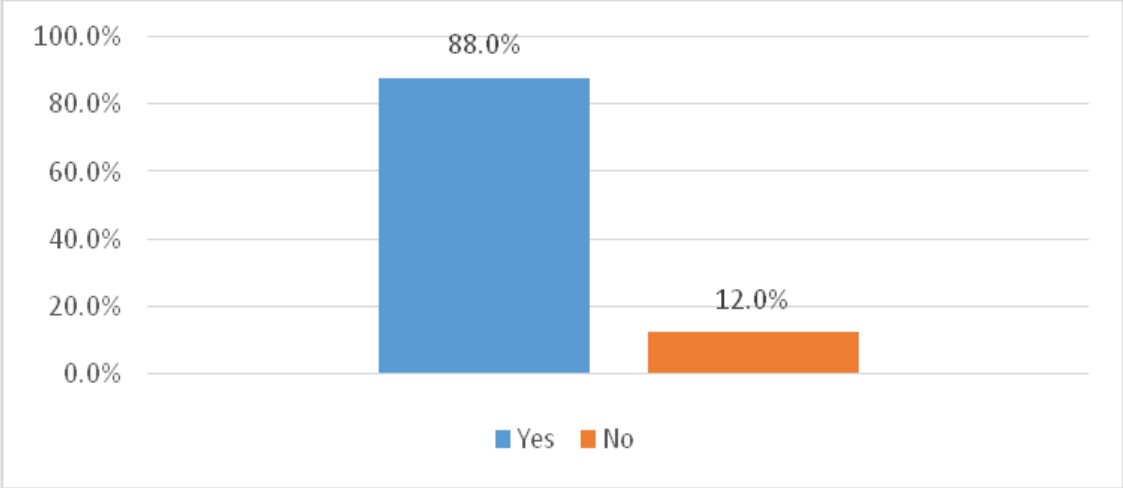

Figure 4.3 Farmer's Recommendations of Topshot Herbicide

Rodenburg et al's (2019) study on status quo of chemical weed control in rice farming in sub-Saharan Africa revealed that for advice on herbicide application methods, farmers primarily rely on their peers, and only a few receive advice from extension services or inform themselves by reading the product label. The results from the study seem to support this finding as farmers indicated their intention to recommend Topshot Herbicide to their peers. The respondents indicated that among the reasons for recommending Topshot Herbicide to other farmers was that it was much more effective than other methods of weed

control they were using before they were introduced to Topshot Herbicide (27.4 %), the ability of Topshot Herbicide to reduce labour and money costs (14.5 %), it gave good results (15.4 %) as indicated in Table 4.24.

The recommendations were influenced by the effectiveness of Topshot Herbicide and its impact on reducing labour costs. This finding agrees with that of Antralinaa, et al's (2015) research on the effects of different weed control methods to yield of lowland rice which reported that unavailability of labour and high cost, manual weed control is becoming impossible. Hence, chemical weed control appears to provide a great promise in dealing with effective, timely and economic weed suppression. In their findings concerning rice production under different weed management technologies adopted by rice farmers in Katsina State, Nigeria, Saleh and Oyinbo (2017) agree that chemical weed control represents an economical alternative to hand weeding in rice production.

Table 4.23 Reasons for Recommending Topshot Herbicide to Other Farmers

Reasons for recommendation	Frequency	Percent
Control of weeds at the best time	6	5.1
Gives good results	18	15.4
Is the best	8	6.8
It is good for farming	5	3.8
Minimizes costs	7	6.0
Reduces labour and money costs	17	14.5
Much effective	32	27.4
Save time and energy	3	2.6
Not applicable	21	18.4
Total	**117**	**100.0**

4.11 Farmer's Source of Information on Topshot Herbicide Training

The study sought to determine where farmers get information on more training opportunities about the use of Topshot Herbicide. The findings show that the Mwea Irrigation Agricultural Development (MIAD) Centre was the most mentioned source of

information on training opportunities (35.9 %), this was followed by other farmers (20.5 %), Agrovet shop (16.2 %), agricultural extension officer (9.4 %), internet and social media (6.8 %), and family members, relatives, friends (5.1 %) as seen in Table 4.25.

Table 4.24 Source of information searched by farmers for more training on Topshot Herbicide

Source of information	Frequency	Percent
Mwea Irrigation Agricultural Development (MIAD) Centre	42	35.9
Agricultural Extension Officer	11	9.4
Agrovet Shop	19	16.2
Family Members, Relatives, Friends	6	5.1
Other Farmers	24	20.5
Other Agricultural Organization(s)	4	3.4
Internet and Social Media	8	6.8
Media outlets (Print, Broadcast, Online)	3	2.7
Total	**117**	**100.0**

The findings suggest that MIAD centre, as the organization promoting the use of Topshot Herbicide, remains the premier source of information on the innovation. The FFDs on Topshot Herbicide have also contributed to the spread of information on its use as farmers indicated searching for more information on the innovation from other farmers.

4.12 Benefits of using FFDs to disseminate information about Topshot Herbicide

The research was also interested in finding out the benefits of using Farmer Field Days (FFDs) in disseminating information about Topshot Herbicide. According to an agricultural officer:

> *"Outreach base is wider as the FFD is conducted at the scheme where most farmers conduct their farming activities. It is cost effective since you are able to reach more farmers at the same time, minimizing the need for other methods of communication. FFDs minimize interference from other sources of information as the famer is able to hear about and see first-hand the new*

Topshot Herbicide being introduced and make an informed decision. While the farmer might ask for opinion from other people, they tend to believe what they see for themselves during an FFD.

The demonstrations that are done during FFDs ensure the farmers see the right way to use Topshot Herbicide, rather than just hearing about it. This minimizes mistakes or misuse when they finally use the herbicide on their farm."

"During FFDs, the farmers are able to interact face to face with agricultural officers and thereby can ask for clarification on anything they do not understand and get the right information right away. The agricultural officers are able to gauge the understanding level of farmers during the FFDs and adjust accordingly to suit the current situation without losing their audience (the farmers). The farmers are also able to give feedback immediately, giving the agricultural officer an opportunity to know what is working for the famers and what is not, hence adjust accordingly."

4.13 Participation of farmers in the Topshot Herbicide FFD

The findings from key informants indicate that the FFD held at the Mwea Irrigation Scheme by the MIAD Centre achieved its purpose, which was to introduce a new agricultural innovation (Topshot Herbicide) and have as many farmers as possible adopting the new innovation. The key informant reckoned that:

"The FFD's aim was to demonstrate to the farmers how to transition from hand weeding on their farms, to chemical weeding using Topshot Herbicide, so as to help them reduce production costs in terms of weed control on their rice fields."

"The FFD was a great success based on the fact that we had targeted to have 50 farmers in attendance per every section (Mwea, Tebere, Karaba, Wamumu, Ndekia) but ended up surpassing our target by 50% in all sections. Attendance remained constant throughout the FFD and punctuality was observed for all the days by the farmers. The interactions between agricultural officers and farmers indicated that the farmers were very eager to learn about the new technology (Topshot Herbicide). They were involved in every step of the way including using their counterparts to demonstrate the new technology as opposed to agricultural officers. We realized that when we used their fellow farmers to do the demonstration, the other farmers were more receptive to the learning and were willing to adopt the new technology. Since the FFD, we have established that more than 70% of the farmers who attended the FFD have adopted the use of Topshot Herbicide on their farm. We are still working towards getting the other 30% to adopt the technology."

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.0 Overview

This chapter presents the summary of the study, conclusion of the study, recommendations of the study based on the findings and suggestions for areas of further studies. The conclusion and recommendations are presented in line with the study objectives. The areas of further studies are derived from the scope and limitations of the study.

5.1 Summary

The objective of the study was to examine influence of Farmer Field Days (FFDs) in communicating agricultural research information at the Mwea Irrigation Agricultural Development (MIAD) centre: A Case Study of Topshot Herbicide. Three specific objectives guided the study: to explore effects of FFDs on knowledge of Topshot Herbicide; to determine influence of FFDs on attitudes towards Topshot Herbicide; and establish influence of FFDs on adoption of Topshot Herbicide among rice farmers. The study was based on the Diffusion of Innovation Theory.

A descriptive research design was adopted targeting 524 rice farmers who participated in the Topshot Herbicide FFDs from which a sample size of 157 respondents was generated using simple random sampling from which an actual sample size of 117 respondents was reached. Questionnaires, interview guides, and document analysis were used to collect data.

A pilot study was conducted among 5 respondents to establish reliability and validity of the instrument. Cronbach Alpha was used to determine reliability of the instrument. The data was analyzed using SPSS and consisted of descriptive statistics for the quantitative data

whilst thematic analysis was used to analyze qualitative data. The secondary data was analyzed using content analysis and was presented alongside the quantitative data.

The demographic profile of the respondents showed that most of them were in the 40-49 and 50-56 years age bracket, most of them were married, with the larger percentage being male, secondary education was the most cited level of education, most of the respondents indicating having farmed rice for more than 15 years with most farmers having less than one acre.

The findings show that chemical weeding was the widely used practice of weed control, followed by manual weeding and a combination of both chemical weeding and hand weeding. According to the study, most farmers received information on weed control and herbicides quarterly followed by yearly then monthly and weekly.

The Mwea Irrigation Agricultural Development (MIAD) Centre was the most mentioned source of information on Topshot Herbicide followed by Agrovet shops and other agricultural organizations - Kenya Agricultural and Livestock Research Organisation (KARLO) and The International Rice Research Institute (IRRI)

The findings revealed that farmers had participated in different Farmer Field Days (FFDs) which ranged from the Mwea Irrigation Agricultural Development (MIAD) Centre coordinated FFDs, FFDs on pest control, FFDs on Water Saving Rice Culture (WSRC), as well as FFDs on water management and herbicide application. The findings suggest that participation in FFDs resulted in the knowledge, positive attitude and adoption of Topshot Herbicide, which is an agricultural innovation in chemical weeding.

5.2 Conclusion

The examination of how FFDs influences knowledge of Topshot Herbicide among rice farmers at the Mwea Irrigation Scheme was the first objective of the study and the findings indicate that the FFDs were an important channel of communication to rice farmers on the introduction of Topshot which is a new herbicide being used in managing weeds. The study found that farmers tend to be more receptive to information when they can interact with the agricultural officers face to face and be given an opportunity to ask questions, seek clarity and provide immediate feedback. The study therefore concludes that FFDs have a positive effect on the knowledge of rice farmers towards agricultural innovations.

The second objective was to determine how FFDs influence attitudes towards Topshot Herbicide among rice farmers at the Mwea Irrigation Scheme to which the results indicated that FFDs had a positive impact on the attitudes of rice farmers towards Topshot Herbicide as they could see for themselves how the product works during the farm demonstration at the FFD. The study also found that the use of fellow farmers to demonstrate to the other farmer how to use the new technology had a bigger impact on the farmers' perception of the new Topshot Herbicide. The study therefore concludes that FFDs have a positive influence on the attitudes of rice farmers towards agricultural innovations.

The assessment on how FFDs affect adoption of Topshot Herbicide among rice farmers at the Mwea Irrigation Scheme was the third objective of the study and the results indicated that FFDs had a great effect on adoption of agricultural innovations, majorly supported by the physical demonstrations carried out at the farm, and the face to face interactions between the farmers and agricultural officers or experts about the new

technology. The study therefore concludes that FFDs have a positive impact on the adoption of agricultural innovations by rice farmers.

The study found that the role of FFDs in communication goes beyond just passing information to farmers. FFDs are a good avenue for farmers to interact face to face with agricultural officers hence giving them an opportunity to seek clarity on issues that concern them and their farming activities. The study concludes that since farmers and agricultural officers are able to communicate face to face, FFDs are a good channel of getting feedback about new agricultural innovations and making necessary adjustments.

While FFDs have a positive effect on knowledge, attitude and adoption of Topshot Herbicide, this study found that the challenges involved in carrying out FFDs on agricultural innovations are quite significant and ought to be considered by stakeholders when planning for an FFD. The study concludes that language, age, perception and education level are key determinants on the knowledge, attitudes and adoption of new agricultural technologies by rice farmers.

The study also found out that having one FFD about an agricultural innovation is barely enough to record the required adoption level of the said innovation as farmers are yearning for more agricultural information from trusted sources. The study concludes that follow up FFDs or farmer visits by agricultural officers play a key role in keeping the farmers grounded to the innovation introduced to them and to sort out any arising challenges and issues long after the first FFD.

5.3 Recommendations

The study makes the following recommendations based on the findings from the study;

i. The findings indicated that FFDs were more relevant to promoting adoption of Topshot Herbicide rather than just spreading knowledge and influencing attitudes towards Topshot Herbicide. The study thus recommends that FFDs should be used more often in an effort to promote adoption of emerging agricultural innovations.

ii. There should be more promotion of FFDs as an information channel because it complements the sharing of information by extension officers. Extension services are not accessible and available for most farmers due to the small number of officers, compared to the large numbers of farmers. Through FFDs, farmers can themselves become extension agents in their locality and share agricultural information with other farmers and even demonstrate to them how new technologies work.

iii. The study recommends inclusion of other groups and stakeholders in FFDs to encourage interaction and exchange of information. These other participants can include Agrovet retailers, non-governmental organizations involved in agriculture, as well as National, and County Government agricultural officers (extension officers).

iv. The findings showed that farmers tend to trust agricultural officers and experts about new technologies, therefore, the study recommends more use of FFDs in communication and information sharing about emerging agricultural innovation as this form of information exchange among experts and farmers fosters trust amongst group members, facilitates adoption and improved sharing of resources among farmers and helps in nurturing social cohesion among all involved stakeholders.

v. The findings indicated that there were less women and youth in FFD demonstrations. There is a need for women and young people to be strengthened if the FFD approach is to have more impact on society and continue to provide a platform for development in agricultural productivity.

vi. While FFDs play a major role in disseminating information about agricultural innovations, the study recommends that it is important for involved stakeholders to have follow-up FFDs or meetings with the farmers to ascertain whether they are having any challenges adopting the new technology, and offer the necessary assistance for improved adoption rate.

vii. The study recommends that stakeholders tailor-make FFDs according to the age, language, perception and education level of the farmers being targeted. A one-size-fit-all FFD may not have the same outcome in one location as it had in another due to the mentioned variables and may give the wrong results if the demographics of the target audience are not considered and well catered for.

viii. The findings in the study indicated that farmers consider agricultural information extremely important in improving productivity, yet most farmers rarely get it. Therefore, stakeholders need to consider a constant sharing of agricultural information with farmers, either through FFDs which this study has found play a key role interpersonal information sharing, or any other method that is more accessible to the farmers depending on their location and demographics.

ix. The study findings indicated that FFDs are a good avenue for immediate feedback between the farmers and the agricultural officers or organizing stakeholders in terms of understanding the usage or application of the new agricultural technology being

introduced. It is the recommendation of this study therefore that FFDs should be used regularly especially in cases where new agricultural technology is being introduced for the first time, in order to facilitate immediate feedback, as well as give room for adjustments depending on what the farmers think is working for them and what is not.

x. According to the findings of the study, farmers find it easier to understand how to use a new agricultural technology through demonstrations during an FFD, as opposed to getting the information from written documents only. The study recommends that agricultural experts should consider using FFDs when introducing complex agricultural technology in order to demonstrate to the farmers first hand on what to do, how to do it and when to do it, not just to merely adopt the technology, but to adopt it and practice it the right way.

5.4 Areas of Further Studies

The study only concentrated on the use of Topshot Herbicide among rice farmers at the Mwea Irrigation Scheme which is located in Kirinyaga County. Further research can be done on the adoption of other agricultural technologies in other farms or other irrigation schemes in the country, and among farmers who grow other types of crops. The study was also carried out when Kenya was grappling with the COVID-19 Pandemic where the researcher was limited in terms of the sample size due to the containment measures that included cessation of movement in and out the Nairobi Metropolitan where the researcher resides, and a Nationwide dawn to dusk curfew. Further studies can be done on the same topic but with a wider sample size and under different limitations and circumstances.

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APPENDICES

Appendix I: Research Questionnaire for Farmer Field Day Participants

My name is Ruth Mutegi, a Masters student at the University of Nairobi, School of Journalism and Mass Communication. I am currently carrying out an academic research that will aid in the completion and award of a degree in Master of Arts - Communication Studies. This questionnaire is aimed at collecting relevant information that will assist in data collection for the academic research. The information you provide will remain confidential and will only be used within the academic parameters for purposes of research only. You have been identified as a key respondent in the data collection process and I am kindly asking you to help me complete my research by providing the information requested below. Thank you for your consideration and assistance.

Section A: Background Characteristics (Tick Appropriately)

1. Age Group
    a) 18-20 years ( )
    b) 20-29 years ( )
    c) 30-39 years ( )
    d) 40-49 years ( )
    e) 50-60 years ( )
    f) More than 60 years ( )
2. Marital Status
    a) Single ( )
    b) Married ( )
    c) Divorced ( )
    d) Widowed ( )
3. Gender
    a) Male ( )
    b) Female ( )
4. Level of Education
    a) No formal education ( )

b) Primary education ( )

c) Secondary education ( )

d) College Certificate/Diploma ( )

e) University Degree ( )

f) Other ( )

Specify.....

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5. Years of Farming

a) Less than 1 year ( )

b) 1-5 years ( )

c) 6-10 years ( )

d) 11-15 years ( )

e) More than 15 years ( )

6. Land Size Under Agriculture

a) Less than one acre ( )

b) 1-2 acres ( )

c) 3-4 acres ( )

d) 4-8 acres ( )

e) More than 8 acres ( )

7. Kindly indicate the crops you grow on your farm.

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8a. Do you have any other sources of income?

a) Yes

b) No

8b. If you answered yes above (8a) kindly specify.

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Section B: Source of Agricultural Information (Tick Appropriately)

9a. Indicate where you get agricultural information from.

a) Mwea Irrigation Agricultural Development (MIAD) Centre ( )

b) Agricultural Extension Officer(s) ( )

c) Agrovet Shop ( )

d) Family Members, Relatives, Friends ( )

e) Other Farmers ( )

f) Other Agricultural Organization(s) ( )

Specify.....

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g) Media Outlets (Print, Broadcast, Online,) ( )

Specify.....

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h) Internet and Social Media ( )

Specify.....

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9b. Rate the sources of agricultural information on a scale of 1-8 where number 1 is the most preferred and effective to you.

a) Mwea Irrigation Agricultural Development (MIAD) Center ( )

b) Agricultural Extension Officer(s) ( )

c) Agrovet Shop ( )

d) Family Members, Relatives, Friends ( )

e) Other Farmers ( )

f) Other Agricultural Organization(s) ( )

g) Media Outlets (Print, Broadcast, Online) ( )

h) Internet and Social Media ( )

10a. How important do you think agricultural information is to a farmer?

a) Important ( )

b) Very important ( )

c) Extremely important ( )

d) Not important ( )

10b. How important do you think agricultural information about new farming methods and technologies is to a farmer?

a) Important ( )

b) Very important ( )

c) Extremely important ( )

d) Not important ( )

11. How often do you receive information about the use of herbicides and weed control on your farm?

a) Every Day (Daily) ( )

b) Once a Week (Weekly) ( )

c) Once a Month (Monthly) ( )

d) Twice a Month (Fortnightly) ( )

e) Every Three Months (Quarterly) ( )

f) Every Six Months (Half Yearly) ( )

g) Every One Year (Yearly) ( )

h) Other

(Specify).....

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12a. Have you received any information about herbicides and weed control for the last 6 months?

a) Yes
b) No

12b. If you answered yes above (12a), indicate where you got the information about herbicides and weed control from.

a) Mwea Irrigation Agricultural Development (MIAD) Centre ( )
b) Agricultural Extension Officer(s) ( )
c) Agrovet Shop ( )
d) Family Members, Relatives, Friends ( )
e) Other Farmers ( )
f) Other Agricultural Organization(s) ( )

Specify.....
.....

g) Media Outlets (Print, Broadcast, Online) ( )

Specify.....
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h) Internet and Social Media ( )

Specify.....
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12c. Rate the sources of herbicides and weed control information on a scale of 1-8 where number 1 is the most effective and efficient to you.

a) Mwea Irrigation Agricultural Development (MIAD) Center ( )
b) Agricultural Extension Officer(s) ( )
c) Agrovet Shop ( )
d) Family Members, Relatives, Friends ( )
e) Other Farmers ( )
f) Other Agricultural Organization(s) ( )
g) Media (Print, Broadcast) ( )
h) Internet and Social Media ( )

Section C: Participation in Farmer Field Days (Tick Appropriately)

13. Are you aware of what farmer field days are?

    a. Yes ( )

    b. No ( )

14. Have you participated in any farmer field days?

    a) Yes ( )

    b) No ( )

15. List below what the farmer field day(s) you participated in was/were about.

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16. Have you participated in farmer field day(s) on the use of Topshot herbicide at the Mwea Irrigation Agricultural Development (MIAD) Centre?

    a. Yes ( )

    b. No ( )

17. If yes (above), indicate below how many days you attended the farmer field days about the use of Topshot herbicide at the Mwea Irrigation Agricultural Development (MIAD) Centre.

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18. Where did you get the information about participating in the farmer field day(s) at the Mwea Irrigation Agricultural Development (MIAD) Center?

    a) Mwea Irrigation Agricultural Development (MIAD) Center ( )

    b) Agricultural Extension Officer(s) ( )

    c) Agrovet Shop ( )

    d) Family Members, Relatives, Friends ( )

    e) Other Farmers ( )

f) Other Agricultural Organization(s) ( )

Specify.....

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g) Media (Print, Broadcast, Online) ( )

Specify.....

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h) Internet and Social Media ( )

Specify.....

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Section D: Source of information about Topshot Herbicide (Tick Appropriately)

19. Kindly indicate how you got to know about the existence and/or use of Topshot herbicide

a) Farmer Field Days at Mwea Irrigation Agricultural Development (MIAD) Center ( )

b) Agricultural Extension Officer(s) ( )

c) Agrovet Shop ( )

d) Family Members, Relatives, Friends ( )

e) Other Farmers ( )

f) Other Agricultural Organization(s) ( )

Specify.....

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g) Media Outlets (Print, Broadcast, Online) ( )

Specify.....

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h) Internet and Social Media ( )

Specify.....

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20. What method of weed control were you using before you learnt about Topshot herbicide?

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21. Approximately how much money were you spending in weed control before you started using Topshot herbicide? Specify amount used for each method you listed above

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22. On average, how much money do you spend in weed control using Topshot herbicide?

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23a. Was the knowledge you gained at the farmer field day(s) you attended at the Mwea Irrigation Agricultural Development (MIAD) Centre about the use of Topshot herbicide relevant to you?

a) Yes ( )

b) No ( )

c) 23b. Give reasons for your answer above (23)

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24a. Following the training you received at the Mwea Irrigation Agricultural Development MIAD Centre, what motivated you to adopt the use of Topshot herbicide in your farm?

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24b. Following the training you received at the Mwea Irrigation Agricultural Development MIAD Centre, what challenges hindered you from adopting the use of Topshot herbicide in your farm?

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Section E: Knowledge of Topshot herbicide (Tick inside the relevant column)

Please indicate to what extent of knowledge you feel you have about Topshot herbicide.

Knowledge of Topshot herbicide		**No knowledge**	**Poor**	**Average**	**Good**	**Very Good**
25	I am knowledgeable in the measurement and mixing of					

	Topshot herbicide.					
26	I am knowledgeable in the application of Topshot herbicide					
27	I am knowledgeable on the application rates of Topshot herbicide					
28	I am knowledgeable on the effects of application of Topshot herbicides					
29	I have knowledge on the advantages of using Topshot herbicide in my farm					
30	I have knowledge on the challenges of using Topshot herbicide in my farm					
31	I have knowledge on how to address the challenges that arise from using Topshot Herbicide					

Section F: Attitude towards Topshot herbicide (Tick inside the relevant column)

Please indicate your perceptions towards the use of Topshot herbicide in your farm.

Attitudes towards Topshot herbicide		**Strongly Disagree**	**Disagree**	**Moderately Agree**	**Agree**	**Strongly Agree**
32	I believe the use of Topshot herbicide will reduce the cost of weeding practices in my farm during planting season					
33	I believe the use of					

	Topshot herbicide will increase the annual yield of my farm					
34	I believe that use of Topshot herbicide will rid me of weed problems in my farm during planting season					
35	I believe that Topshot herbicide will control all paddy field weeds up to the time of harvesting the crop					
36	I believe the use of Topshot herbicide will reduce the annual harvest losses in my farm					

Section G: Adoption of Topshot herbicide (Tick inside the relevant column)

Please indicate to what extent you have adopted Topshot herbicide to deal with weeds in your farm.

Adoption of Topshot herbicide		**Not at all**	**A little extent**	**Moderate extent**	**To some extent**	**To a great extent**
37	I use Topshot herbicide for weeding purposes on my farm					
38	I recommend the use of Topshot herbicide to other farmers for weeding in their farms					
39	I do not have to engage labour for hand					

	weeding when I use Topshot herbicide in my farm					
40	I will be using Topshot herbicide from now onwards to deal with weeds in my farm					
41	I have successfully adopted Topshot herbicide in my farm without any assistance					

Section H: Source of Topshot herbicide. (You can tick more than one)

42. Please indicate where you get/got the Topshot herbicide that you use/used on your farm

a) Mwea Irrigation Agricultural Development (MIAD) Center ( )
b) Agricultural Extension Officer(s) ( )
c) Agrovet Shop ( )
d) Family Members, Relatives, Friends ( )
e) Other Farmers ( )
f) Other Agricultural Organization(s) ( )

Specify.....
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43. Would you recommend the use of Topshot herbicide in weed control to other farmers?

a) Yes ( )
b) No ( )

44. Give reasons for your answer above (36).

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45. Have you looked for more information or training about the use of Topshot herbicide since you attended the farmer field day(s) at the Mwea Irrigation Agricultural Development (MIAD) Center?

a) Yes ( )
b) No ( )

46. From where have you been looking for more information or training about the use of Topshot herbicide?

a) Mwea Irrigation Agricultural Development (MIAD) Center ( )
b) Agricultural Extension Officer(s) ( )
c) Agrovet Shop ( )
d) Family Members, Relatives, Friends ( )
e) Other Farmers ( )
f) Other Agricultural Organization(s) ( )

Specify.....
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g) Media (Print, Broadcast, Online) ( )

Specify.....
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h) Internet and Social Media ( )

Specify.....
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47. Which of the sources of information and training about the use of Topshot herbicide in the above question would you say have been effective to you? Rate each of them on a scale of 1-8 where number 1 is the most preferred and effective to you.

a) Mwea Irrigation Agricultural Development (MIAD) Center ( )

b) Agricultural Extension Officer(s) ( )
c) Agrovet Shop ( )
d) Family Members, Relatives, Friends ( )
e) Other Farmers ( )
f) Other Agricultural Organization(s) ( )
g) Media (Print, Broadcast, Online) ( )
h) Internet and Social Media ( )

48. What other general information or recommendation would you like to give about participating in farmer field days?

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THANK YOU FOR YOUR TIME.

Appendix II: Interview Guide

1. Which farmers were targeted for the FFD conducted by the MIAD Centre on Topshot Herbicide?
2. How did you communicate to the farmers to participate in the FFDs at the MIAD Centre?
3. How would you describe the participation of farmers in the FFDs conducted at the MIAD Center?
4. How have the FFDs contributed to increasing farmers' knowledge about Topshot herbicide?
5. How did the FFDs contribute to changing the attitudes of farmers towards Topshot herbicide?
6. In your opinion, do you believe participation in the FFDs contributed to the adoption of the Topshot herbicide?
7. To what extent do you think farmers have adopted the use of Topshot herbicide after the FFDs?
8. What are the benefits of using FFDs to disseminate information about Topshot herbicide?
9. What challenges and barriers did you experience in conducting the FFDs about Topshot herbicide?
10. How are you helping farmers deal with the challenges experienced while using Topshot herbicide?
11. How many FFDs have you conducted about Topshot herbicide at the MIAD Centre?
12. Have you offered any follow up assistance or training to farmers on the use of Topshot herbicide after the FFDs?

Appendix III: Farmers Attending The Topshot Herbicide Farmer Field Day Organized By The Mwea Irrigation Agricultural Development (MIAD) Center

Introduction to Topshot Herbicide during a Farmer Field Day

First introduction to Topshot Herbicide during a Farmer Field Day

Introduction and demonstration of Topshot Herbicide at the rice field during an FFD

Farmers Being Taken Through the Measurement of Topshot Herbicide during an FFD

Farmers Being Taken through the Measurement of Topshot Herbicide during an FFD

Demonstration of Appropriate Measurement of Topshot Herbicide during an FFD

Demonstration of Spraying of Topshot Herbicide on Rice Fields by Fellow Farmers during an FFD

Application of Topshot Herbicide on Rice Fields by Farmers during an FFD

Appendix IV: Introduction Letter

UNIVERSITY OF NAIROBI
COLLEGE OF HUMANITIES & SOCIAL SCIENCES
SCHOOL OF JOURNALISM & MASS COMMUNICATION

Telegram: Journalism Varsity Nairobi
Telephone: 254-020-491 0000, Ext. 28080, 28061
Director's Office: 254-020 4913208 Direct Line)
Email: director-soj@uonbi.ac.ke

P.O. Box 30197
Nairobi.
Kenya

OUR REF:
YOUR REF:

DATE: 16 June, 2020

TO WHOM IT MAY CONCERN

RE: MUTEGI RUTH KANGAI - K50/6919/2017

This is to confirm that the above named is a bonafide student at the University of Nairobi, School of Journalism and Mass Communication pursuing Master of Arts degree in Communication Studies.

Ms. Mutegi has completed her course work and is currently going to collect data for her research project leading to a Master of Arts Degree in Communication Studies.

Any assistance accorded to her will be highly appreciated.

UNIVERSITY OF NAIROBI DIRECTOR 16 JUN 2020 SCHOOL OF JOURNALISM & MASS COMMUNICATION

Daisy Muthoni
Ag. Administrative Assistant
School of Journalism & Mass Communication

/dm