**EFFECTS OF FARMER SOCIO-DEMOGRAPHIC FACTORS ON AGRICULTURAL PROJECTS IN KENYA: CASE OF NARIG PROJECT IN MAKUENI COUNTY.**

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**NOVEMBER 2023**

# DECLARATION

This research project is entirely original to me and has never been submitted to any other university for credit.

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This report has been submitted for review with my approval as a University Supervisor.

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# Dedication

This research project is dedicated to all those who wish me well.

# ACKNOWLEDGEMENTS

I wish to acknowledge the following who have walked with me through my studies for this degree in public policy and administration. The Government of Makueni County for funding this Master’s degree. My former supervisor, Paul Wasanga whose assignments inspired me to pursue this degree. My lecturers in the Department of Public Policy and Administration, Kenyatta University. My research project supervisor Dr Patrick Mbataru for guiding me in the research project. My family for always understanding and supporting me in my studies. Those of my colleagues at work who have supported me in my studies. The respondents who gave me the research information and the data collectors. And Janet Mutua who helped coordinate the research.

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# ABBREVIATIONS AND ACRONYMS

ADP Agricultural Development Project

CIDP County Integrated Development Plan

CIG Common Interest Group

ECDP Eastern Community Development Programme

FAO Food and Agriculture Organization of the United Nations

GDP Gross Domestic Product

ICT Information Communication Technology

KM Kilometre

KNBS Kenya National Bureau of Statistics

NACOSTI National Commission for Science, Technology and Innovation

NARIGP National Agriculture and Rural Inclusive Growth Project

NFDP National Fadama Development Project of Nigeria

PAAS Project Pilot Asset Acquisition Support of the NFDP

PACA Agricultural Competitiveness Improvement Project of Cameroon

PO Producer Organization

SDG Sustainable Development Goals

SPSS Statistical Package for Social Science

TFP Total Factor Productivity

TIMP Technologies, Innovations and Management Practices

VC Value Chain

VMG Vulnerable and Marginalized Groups

# OPERATIONAL DEFINITION OF TERMS

**Farmer attitude**: Farmer attitude describes how the farmer feels or perceives about the project in terms of its potential benefit to him and his/her level of acceptance of the project.

**Farmer demographic characteristics**: This is the description of a farmer. It helps to have an understanding of the farmer including their gender, age, education level among other aspects and how they influence the farmer in implementing the project.

**Farmer knowledge of project and enterprise:** Farmer knowledge describes the aspects, information and skills acquired over time through experience and/or education that are related to the project and enterprise. It also includes the theoretical and practical understanding relating to the project and farm enterprise the farmer is undertaking.

**Farmer practices**: Farmer practices describe some of the things the farmer does routinely or habitually in the course of execution of the farming enterprise being undertaken including the scale of production, type of enterprise, whether full time or part time, utilizing extension services and embracing contemporary agricultural technology.

**Project Performance**: This is a measure of the progress of implementation and success of the project under study. It captures aspects relating to the objectives of the project: increasing farm productivity and profitability.

# ABSTRACT

Agriculture significantly influences food security and economic progress at a global scale. Many developing countries including Kenya invest in agriculture towards rural development and poverty alleviation. In this investment, most countries work through agriculture development projects which are expected to produce results. Literature on assessment of performance of agricultural development projects tend to focus on the project cycle. There is little literature on the role of the farmer in the performance of these projects, yet they are key to the success of the projects. To fill in the missing gaps, this study aims at assessing the performance of the NARIGP, a five-year project funded by the World Bank that has been carried out by the Kenyan government in 21 out of 47 counties in Kenya including Makueni County where it is implemented in 20 out of 30 wards across the six sub-counties. The project's overarching goal is to boost agricultural productivity and profitability, which will subsequently enhance livelihoods and lessen vulnerabilities in the selected counties' targeted rural populations. The study will be in Makueni County. The study utilized the Agrarian change theory by Boserup and the theory of planned behavior as theoretical frameworks of the research. The research employed a descriptive survey design. The target population was the 18,754 farmers who have been implementing the project. A stratified and purposive sampling design was used to select 392 respondents, a sample size determined using sample size determination table recommended by Naing (2003), a structured questionnaire was used with the data being collected by research assistants to an online tool for analysis using inferential and descriptive statistics. Descriptive statistical analysis used percentages, means and frequencies while inferential statistical analysis used Pearson correlation and linear regression. Farmers’ profile, farmers’ knowledge, farmers’ attitude and farmers’ practices has a R squared of 0.66, meaning that it accounts for 66.6% of the variability in productivity. Farmers’ attitude account for 58% of the variability in agricultural productivity. Farmer knowledge account for 55.3% of the variability in productivity at the county. Farmer practices explain 52.9% of the variability in agricultural productivity. The study concludes that farmers’ attitude, knowledge and practices all contribute the success of agriculture development projects. The study therefore recommends that project formulation should consider these factors to enhance success.

# CHAPTER ONE:

## Introduction

This first chapter describes the study’s background, problem statement, objectives, research questions, assumptions, justification, and scope.

## Background to the Study

### State of Agriculture and the use of projects in agriculture development.

Most developing countries' efforts to reduce poverty and improve food security are centered on agricultural growth and agricultural projects are key in addressing challenges in the agriculture sector including food insecurity and rural underdevelopment. Agricultural projects have been used as interventions to enhance agricultural income stability and increase revenue through various means, such as increased investment, improved input utilization, adoption of new technology, favorable input/output prices, reduced risk, and enhanced long-term sustainability. The agricultural sector can exert a substantial influence on the food security of families through the implementation of projects and policies. These initiatives primarily focus on developing nations, aiming to improve healthcare and provide individuals with opportunities to escape poverty and hunger. (Ibrahim et al., 2014).

Medina et al., (2018), found that agricultural projects had contributed to the strengthening of the Local Agricultural Development of a Cuban municipality while in Malaysia, an agricultural development project, the Agropolitan project has changed the participants’ livelihoods after membership to the project, particularly in terms of poverty reduction, enhanced social well-being and lifestyle, as well as the creation of employment opportunities and increased income for those involved. (Rahman, Latip & Samsurijan, 2020).

According to Inegbedion et al. (2019), agricultural development programmes (ADPs) were created and implemented in Nigeria in response to a decline in agricultural productivity. They were intended to increase production and productivity for a period of time that was reasonable to the farmers' well-being, which was then expected to result in an increase in the community’s per capita income. The National Fadama Development Project (NFDP) is an agricultural initiative implemented in Nigeria, which seeks to improve food security and eradicate poverty among Fadama farm households in the country (Undiandeye & Vosanka, 2012). It was found that the active involvement in the development project had a positive impact on participants' well-being and living conditions, leading to higher income, suggesting that sustaining the initiative could effectively alleviate poverty in rural farming households.

In Cameroon, an agricultural project, the Agricultural Competiveness Improvement project (PACA) was found to have a favorable effect on recipients' work circumstances, agricultural production and income level of beneficiary groups (Takwa, A. C. & Kimengsi, 2016). Agriculture developmental programmes, have been shown to improve income generation, farm productivity, poverty alleviation, and job creation. In general, agricultural development programs have the capacity to enhance the livelihoods of farmers that practice small-scale farming and the communities in the areas that these programs are implemented (Chepape & S, 2020).

### Agriculture development and projects in Kenya

According to Wankuru et al. (2019), the agriculture industry in Kenya accounts for over 51% of the country's GDP and generates jobs for around nine million Kenyans, making it a significant growth driver for the economy and the country's population.

Furthermore, in Kenya, the decline in rural poverty was attributed to agricultural activities in 31.4 percent of households, underscoring the enduring importance of agriculture as the primary income-generating sector for both impoverished and non-impoverished households in rural setups.

Nearly 30% of Kenya's children are considered to be undernourished, and widespread micronutrient deficiencies affect over 10 million people (MOA, 2011). At any given time, between 2 and 4 million people in Kenya need emergency food assistance. This means a big proportion of the Kenyan population is not getting adequate nutrition. The agriculture sector in Kenya and Makueni County in particular has the potential to generate economic development and employment opportunities for a significant portion of the population.

Agriculture development projects can be used to stimulate both agricultural and economic growth. According to a study by Irungu & Moronge (2016), agricultural projects have a growing impact on employment opportunities, food security, generation of wealth, and the emergence of new economic innovations. However, the study results also indicated that agricultural projects have a limited effect on the country's economy due to the numerous challenges they encounter, resulting in many of these projects not reaching their maximum potential and performing below expectations.

### Agriculture development and projects in Makueni County

In Makueni County, 78% of all household income is derived from agriculture. Many people in the population engage in subsistence farming, whereas a small number engage in commercial farming. Limited agricultural productivity, limited adoption of new technology, insufficient policies, inadequately developed inputs and output markets, and reliance on sporadic and uneven rainfall are the defining characteristics of the agricultural sector (GoMC & KNBS, 2020). According to Schedule 4 of the (The Constitution of Kenya, 2010), one of the devolved tasks is agriculture. Various projects have been executed in the county to support agricultural development. Some are designed and implemented at County level while others are implemented in partnership with the National Government and other organizations. According to the Makueni CIDP (2018), one of the key lessons from the CIDP 2013-2017 was the importance of project data and information, one of the objectives of this study.

### National agricultural and rural inclusive growth project (NARIGP) in Makueni County.

NARIGP is a five-year project funded by world bank and implemented by the Kenyan Government. It is implemented in 21 out of 47 counties in Kenya including Makueni County where it is implemented in 20 out of 30 wards across the six sub-counties. Its goal is to make smallholder subsistence farming an innovative, commercially focused, and modern industry through improved agricultural commodity productivity, commercialization, and competitiveness as well as the development and management of key production factors like land, water, and rural finance. The project's goal is to boost the agricultural output and profitability in the designated rural areas. Increases in profitability and the implementation of the enhanced agricultural technologies, innovations, and management practices (TIMPs) that the project is promoting serve as indicators of how well the initiative is doing towards achievement of its goal.

## Statement of the Problem

The Kenyan government has made investment in agricultural projects in order to increase agricultural growth. Some of these projects include the World Bank funded agricultural projects such as NARIGP. One of the agricultural projects implemented in Makueni, the Kenya Agriculture Productivity Project was assessed as having shortcomings in the achievement of the project’s objectives (World Bank Group, 2019). Irungu & Moronge (2016) found that there has been little research on the factors that affect how well agricultural initiatives perform in Kenya and suggested more studies in this area. Most studies in the area of agricultural project implementation have left out the role of the farmer in the performance of the projects, yet the farmer is a key player. This research therefore seeks to examine the significance of farmers’ roles as a critical determinant influencing the performance of agricultural development projects while also addressing the existing gap in literature on the area of study.

## Objectives of the Study

* + 1. To determine the effects of farmer demographic characteristics on the performance of the N ARIGP
    2. To explore the role of farmer attitude on the performance of the NARIGP
    3. To determine the effects of farmer knowledge of the project and enterprise on the performance of the NARIGP.
    4. To assess the impact of farmer practices on the effectiveness of NARIGP

## Research Questions

The study aims to investigate the following questions:

* + 1. Do farmer demographic characteristics affect the performance of the NARIGP?
    2. Does farmer attitude affect the performance of the NARIGP?
    3. Does farmer knowledge of project and enterprise affect the performance of the NARIGP?
    4. Do farmer practices impact on the effectiveness of the NARIGP?

## Assumptions of the study

The study operates under the assumption that the active involvement of famers significantly contributes to the success of agricultural projects, with the overall effectiveness of the NARIGP relying heavily on the farmers' implementation of their roles.

## Justification of the Study

Agriculture development projects are aimed at ensuring food security and rural economic development. The success of implementation of these programmes is therefore key to rural development. This study will therefore identify key project success factors related to the farmer and provide policy recommendations that can be used to approach the farmers to ensure project success. Makueni is one of the counties implementing the NARIG Project. There is little of literature on effects of the factors associated with the farmer and the main goal of this research is to address this gap. NARIGP is one of the major agricultural projects in Kenya and any lessons learned from its implementation are key in future project conception for the country.

## Scope and limitations of the of the Study

### Scope of the study

One of Kenya's 47 counties, Makueni County, serves as the base for this study. It is located in the country's South Eastern region and shares borders with Taita Taveta to the south, Machakos to the north, Kitui to the east and Kajiado to the west. The County is positioned within the longitudinal range of 37 10' east and 38 30' and Latitude 135' south. It is 8,176.7 KM2 in size. The study will target farmers who are part of the NARIG project in the county and will be conducted between July and August 2023. It will focus on the factors relating to the farmer that have potential to influence success in project implementation. This study is not an impact evaluation research.

### Limitations of the study

The target population for this research is the rural farmer who might have limitations in responding to some of the questions. The interviewers will be trained to enable them ensure the respondents understand the study questions.

# CHAPTER TWO: LITERATURE REVIEW

## Introduction

This Chapter gives a critical evaluation of both empirical and theoretical literature to create a foundation for the study and ends with identification of literature gaps. The empirical review focuses on studies of a similar nature done elsewhere while theoretical review provides a foundation for the study.

## Empirical review

### Farmer demographic characteristics

The farmers' educational attainment is presumed to positively influence their willingness to embrace new farming techniques. (Adeyanju et al., 2021; Lavison, 2013), whereas age is considered a significant determinant in the implementation of agricultural projects, because compared to young farmers, older farmers are presumed to possess extensive knowledge and expertise. (Kariyasa & Dewi, 2015; Adeyanju et al., 2021). According to Mignouna et al. (2016), household size is used to gauge the availability of labor. Age, gender, years of formal education, and family size were some of the characteristics that influenced young people's decisions to participate in an agricultural development program, according to a research by Adeyanju et al. (2021) in Nigeria. Age, education, credit access and economic status are significant in promoting sustainable agriculture practices adoption (Waseem et al., 2020). In a review of past studies, Mwangi & Kariuki (2019) identified household-specific factors including education, age, gender, and household size as key in technology adoption in agriculture.

### Farmer attitude

According to (Odoyo, 2013), some of the success factors of project implementation include minimal negative influence by the community, welcoming of the project by the farmers, clear understanding of the aims and objectives of the project and perception of the project as beneficial to them. Personality traits including intention and perception were identified as possible impediments to participation in agricultural projects (Adeyanju et al., 2021). Top-down approach in implementation of some projects significantly influences the involvement or noninvolvement of farmers in agricultural projects (Botlhoko & Oladele, 2013). According to a study by Irungu and Moronge (2016), stakeholders’ participation had a beneficial impact on the effectiveness of agricultural based projects, with the most significant positive influence observed in project performance specifically related to agriculture.

Farmers' adoption of sustainable agriculture methods is influenced significantly by their perceptions of sustainable agriculture and their assessment of its viability (Waseem et al., 2020). A crucial prerequisite for adoption is how farmers perceive a new technology (M. Mwangi & Kariuki, 2015).

### Farmer knowledge of project and enterprise

According to Shaik et al (2014), access to information by farmer is a key factor towards achieving increased agricultural productivity. Extension services have been identified as key in fostering farmer knowledge and information as they give the farmer better skills on particular task and farming methods and offer innovation and ideas and farmers can share experience with each other (Oduro-Ofori et al., 2014). Since knowledge is often specific to the type of farm enterprise, knowledge reaches farmers differently depending on what they produce. As a result of implementation of agricultural developmental programme, smallholder farmers are able to utilize extension services to have access to technical assistance, advice, and knowledge management. (Chepape & S, 2020). This helps to update farmer knowledge in their areas of interest.

### Farmer practices

According to Chepape (2020), most small-scale farmers are engaged in full-time farming activities. For various farming operations, the type of agricultural commodity and production levels are crucial factors in boosting profits. In a study, Duveskog et al. (2011) discovered that enrolling in Farmer Field Schools not only provides individuals with agricultural knowledge and skills but also contributes to personal development and changes in interpersonal relationships. This is demonstrated by a considerable change in how people interpret their lives and farming techniques in particular.

Under NARIGP there are four value chains under promotion using the Technology, Innovations and Management Practices (TIMPs) approach. Under the green gram (applicable to other crops) production for example, Karimi et al. (2019) have improved varieties, integrated pest and disease management, soil fertility management, agronomic practices and moisture and soil conservation while under poultry production, Mwangi et al. (2019) use of improved breeds, housing, feeding equipment, hatching and brooding, feeds, management of diseases and manure management as some of the technologies and practices.

### Project performance

One of the success factors of project implementation is the extent of adoption of the technologies, innovations and management practices and if possible, an evaluation of the influence of the adoption and the resultant outcomes of the adoption (De Janvry et al., 2010). According to Prinsloo (2017), agricultural development project success can be accomplished by increasing smallholder competitiveness; enhancing market access for locally grown produce by small-scale, rural farmers, leading to new opportunities, new revenue, and eventually economic development; greater employment in agriculture and better subsistence farming incomes. These are some of the success factors that a development programme should be looking at in order to create sustainability including the extent of adoption of the technologies, innovations and management practices and if possible, an analysis of the effect of the adoption and the outcomes of the adoption (De Janvry et al., 2010).

### Summary of empirical literature review

Some of the key issues to note from this section are that Agriculture development projects have been used to spur local economic development across the world. The literature review has highlighted some of the determinants of success of these projects. However, there isn't a lot of literature on the farmer's function and issues that affect farmers in the successful implementation of these projects in the Kenyan context. Such factors identified in other regions include: Farmer demographic characteristics (gender, age, educational level, household size, household headship, economic status); farmer attitude (acceptance of project, clear understanding of the project aims and objectives, perception about project benefits to the farmer, involvement in early stages of the project); farmer knowledge (farmer knowledge networks, knowledge of the specific enterprises farmer is involved in) and farmer practices( full time or not, type of commodity, credit access etc.). Specific studies in Kenya include Musembi's (2019) study on the EDCP-funded agricultural projects in Machakos County which focused only on the implementation of innovative farming techniques by farmers, project monitoring and evaluation, and stakeholder participation in project execution. Mutunga (2015) put an emphasis on capacity building, demographic factors, financial stability, and land availability. Wangeci (2013) focused on examining how project planning and the execution process influenced the efficacy of agricultural projects. Omache (2016) concentrated on elements like involvement in data collecting and human resource staff members' talents in agriculture. According to a study conducted by Irungu and Moronge (2016) in Nyeri County, there is insufficient research describing the determinants of agricultural projects’ performance in Kenya, indicating the necessity for additional studies to explore this area.

## Theoretical review

### Boserup's theory of agrarian change

According to Boserup's theory, population pressure related to the tendency toward population growth causes numerous technical and other developments that lead to a rise in agricultural production and the availability of food. Based on her theory, the main factors responsible for changes in land utilization, agricultural technology, land tenure systems, and settlement patterns are primarily influenced by growth in population. She argued that the growth in population is not linked to food availability. (Grigg, 1979). According to Robinson & Schutjer (1984), agriculture does respond to "pressures" by increasing output from the preexisting potential surplus. Boserup contends that population growth is one of the pressures. A new, more intensive technology, less leisure time, less domestic handicraft production, or an increased output scale can all result in higher output. As a result, after the process of change in agriculture has started, the mechanism by which the surplus is achieved and its interaction with the pace of rural population expansion—rather than population growth alone—determine the eventual result in a significant way. This establishes a foundation on which agricultural development can be discussed and over time and has been advanced further to identify more forces driving agricultural development and not just population pressure.

### Theory of planned behavior

Ajzen (1991) asserts that although some variables and processes, such as willingness to engage in a behavior or social support, appear to go beyond the theory of planned behavior, they may actually be accommodated within it. The theory of planned behavior can predict intents and behavior rather well, according to Ajzen (1991). Intentions shape behaviors, but not all of them are actualized; some are completely abandoned, while others are adjusted to accommodate changing circumstances. The idea of planned conduct considers both actual and perceived control over the behavior in question.

According to Karapandzin et al. (2019), attitudes have a critical role in explaining the espousal of new agricultural technology, while subjective norms and perceived behavior control make a statistically significant but comparatively smaller contribution. Farmers' intentions to diversify their agricultural output are low, according to research by Borges and Senger (2017). The three theory of planned behavior constructs—attitude, subjective norm, and perceived behavioral control—are all positively connected with this intention. Sholihah & Djamaludin (2018) also reported on this observation. Based on the theory, the implementation of sustainable agricultural techniques is influenced by all of its components, including attitude, subjective norms, and perceived behavioral control (Waseem et al., 2020).

### Summary of theoretical review

From the theoretical review, it can be concluded that Boserup’s theory of agrarian change established the foundation for which agricultural development can be discussed and over time, it has been improved to identify more forces driving agricultural development and not just population pressure. The planned behavior theory is important in explaining human behaviour towards adoption of new technology in agricultural development. It can be further extended to imply adoption and implementation of agricultural development which still remains a key aspect of rural economic development. Researches on the theory of planned behavior suggest that farmers exhibit limited willingness to adapt to change and that all three attributes of the theory influence farmers’ decisions concerning the adoption of new technologies or taking up new projects. This enhances the hypothesis of this study that there are factors associated with the farmer that influence the implementation of agricultural projects and adoption of agricultural technology.

## Isolation of gaps in literature

Table 2.1: Isolation of gaps in literature

| **Author/Year** | **Study** | **Gap** | **Contribution of current study** |
| --- | --- | --- | --- |
| Makate, C., Makate, M., & Mango, N. (2018) | Farm household typology and adoption of climate-smart agriculture practices in smallholder farming systems of southern Africa | Farmer characteristics, attitudes and knowledge. | Definition of farm typologies (farmer practice) and socio-economic characteristics of households.  This study will explore role of farmers demographic characteristics, attitudes and knowledge in agricultural projects. |
| Musembi, F. P. (2019) | Factors influencing the performance of agricultural projects funded by eastern community development programme (ECDP) in Machakos county, Kenya | Farmers attitudes towards projects, farmer knowledge and practices not captured. | Adoption of new technologies in agriculture, and stakeholder involvement.  This study will explore role of farmers’ demographic characteristics, attitudes in agricultural projects. |
| Mutunga, T. M. (2015). | Factors influencing sustainability of Fish farming in Matungulu sub-county, Machakos, Kenya | Farmers attitudes towards projects, farmer knowledge and practices not captured. | Financial stability and demographic factors  This study will explore the role of farmer attitudes, knowledge and practices in agricultural projects. |
| Irungu & Moronge (2016) | Determinants of Perfomance of Agricultural Projects in Kenya: A Case of Nyeri County | There is a scarcity of research on the factors influencing the effectiveness of agricultural projects in Kenya. | This research will focus on examining the determinants of agricultural projects performance within the context of Kenya. |
| Kiplangat Rutto (2016) | Factors influencing involvement of legume farmers in agricultural training programs in Makueni County, Kenya | Farmer attitudes, economic factors, farmer knowledge and practices. | This study will explore farmer attitudes, knowledge and practices in agricultural projects. |

Source – Author 2023

## Conceptual framework

Figure 2.2: Conceptual framework

**Farmer demographic characteristics**

* Household size, Education level, Gender, Income level, Age
* Household headship, Chosen value chain, length of time in the value chain

**Farmer attitude**

* Farmer fatigue
* Level of Consultation at programme development/stakeholder consultation
* Attitude towards projects/acceptance
* Reaction towards project approach
* Perceived benefits, sustainability, effectiveness

**Farmer knowledge of project and enterprise**

* Understanding of the project objectives
* Knowledge on their chosen enterprise
* Good agricultural practices
* Modern production technologies
* Product marketing

**Project performance**

* Adoption of TIMPS
* Increase in enterprise productivity
* Increase in enterprise profitability
* New sources of income
* Creation of employment

**Farmer practices**

* Type of farm enterprises
* Chosen enterprise
* Size of farm enterprise
* Access to and use of extension services, credit
* Farming experience, full time or not
* Other income sources

Independent variables Dependent variable

Source – Author 2023

# CHAPTER THREE: RESEARCH METHODOLOGY

## Introduction

Chapter three covers the location of the study, research design, sampling procedures, target population, research instruments, and sample size. Additionally, it provides data collection methods, analysis, and methods of presenting findings.

## Research design

The research design encompasses a descriptive survey methodology. The descriptive survey research design examines a subset of the population to generate quantitative insights and descriptions of the population's attitudes, opinions, or trends. It entails direct contact with individuals who possess traits, behaviors, and attitudes that are pertinent to the inquiry in order to characterize a specific state of affairs that is present at a specific time (Bostley et al., 2019). Without altering any data, it provides statistical data on population characteristics that are of importance to policymakers and assesses the situation as it stands at the time (Mugenda & Mugenda, 2003). A survey is a type of research method where a sample is either verbally or in writing interrogated, or the responses are observed and described in some way (Zikmund, William G.Carr.Jon C.Babin,Barry Griffin,2013)

## Analysis of Variables

There are four independent variables for this study; farmer demographic characteristics, farmer attitude, farmer knowledge of project and enterprise; and farmer practices. The dependent variable is project performance as measured through achieved programme objectives.

Table 3.2 Analysis of variables

| **Independent variables** | **Category of measurement** | **Dependent** | **Category of measurement** | **Test** | **Indicator** |
| --- | --- | --- | --- | --- | --- |
| Farmer demographic characteristics | Categorical | Performance | Continuous | T-test | * Gender * Level of education * Level of income per month * Headship of household * Value chain of interest |
| Continuous | Performance | Continuous | Simple linear regression | * Age * Size of household |
| Farmer attitude | Continuous | Performance | Continuous | Simple Linear Regression | * Farmer fatigue * Level of Consultation at programme development/ stakeholder consultation * Attitude towards projects/ acceptance * Reaction towards project approach * Perceived benefits, sustainability, effectiveness |
| Farmer knowledge of project and enterprise | Continuous | Performance | Continuous | Simple Linear Regression | * Understanding of the project objectives * Knowledge on their chosen enterprise * Good agricultural practices * Modern production technologies * Product marketing |
| Farmer practices | Continuous | Performance | Continuous | Simple Linear Regression | * Type of farm enterprises * Size of farm enterprise * Availability and utilization of extension services * Access to and use of credit * Farming experience * Full time farmer or not * Other income sources |

Source – Author 2023

## Location of the study

The research was based in Makueni County, one of the 47 counties in Kenya. Makueni County is located in the South Eastern region of the country and shares borders with Machakos to the North, Kitui to the East, Kajiado to the West, and Taita Taveta to the South. It covers an area of approximately 8,176.7 square kilometers and is situated between Latitude 1°35' South and Longitudes 37°10' East and 38°30' East (GoMC, 2016).

## Target population

All of the farmers who have been brought on board and provided with funding from the NARIGP in Makueni County were targeted for this study. A total of 18,754 farmers in 540 groups were involved in the project and received funding between 2018/2019 financial year and 2020/2021 financial year. The farmers are further segregated as indicated below.

Table 3.4: Target population

|  |  |
| --- | --- |
| **Category** | **Target population** |
| Male adult | 5,686 |
| Female adult | 10,174 |
| Male youth | 1,114 |
| Female Youth | 1,780 |
| **Total** | **18,754** |

(Source – County Project Coordination Unit, Makueni County)

## Sampling techniques and sample size

### Sampling techniques

The research adopted stratified and purposive random sampling. The project is implemented in 20 wards out of 30 wards in six sub-counties. The study selected two sub-counties, Mbooni to represent the higher zones and Kibwezi East to represent the lower zones and then two wards were selected from each Sub-county. The target subpopulation was then divided into four strata (male adult, female adult, female youth, and male youth) and subjected to strata at two levels, first along the value chains to ensure that each value chain is represented. To choose the participants for each stratum, a simple random sampling was employed to guarantee that all respondent categories were represented and that the selected sample accurately represents the entire population under investigation.

### Sample size determination

The research population is fairly homogeneous and therefore does not need a large sample. The sample size for this study was determined using published tables as recommended by Naing (2003) and (Israel, 1992).

Figure 3.3: Determination of sample size

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Population Size** | **Sample size (n) for precision (e) of:** | | | |
|  | ± 3% | ± 5% | ± 7% | ± 10% |
| 8,000 | 976 | 381 | 199 | 99 |
| 9,000 | 989 | 383 | 200 | 99 |
| 10,000 | 1.000 | 385 | 200 | 99 |
| 15,000 | 1,034 | 390 | 201 | 99 |
| 20,000 | 1,053 | 392 | 204 | 100 |

Source :Adopted from Naing, 2003

Based on our population of 18,754 and working with a confidence level of 5%, the sample size lay between 390 and 392. The study adopted the higher value of 392. The sample was distributed among the four identified strata in the population as per table 3.3 below.

Table 3.4: Sample Size

|  |  |  |
| --- | --- | --- |
| **Category** | **Target population** | **Sample size** |
| Male adult | 5,686 | 119 |
| Female adult | 10,174 | 213 |
| Male youth | 1,114 | 23 |
| Female Youth | 1,780 | 37 |
| **Total** | **18,754** | **392** |

Source: Author 2023

## Research instruments

This study used a structured questionnaire with closed ended questions as stated by Taherdoost (2019) and Saeidi & Khaliliaqdam, (2013). The questionnaire items were formulated in alignment with the research objectives and research questions to ensure their relevance and effectiveness.

## Pilot study, validity and reliability

A pilot study was done targeting two farmer groups to help examine particular components of the research to determine whether the chosen procedures would work as planned (Zikmund et al., 2013) while also evaluating the dependability and authenticity of the data collection instrument. A quick analysis of the pilot data showed that the tool was going to be reliable and valid. We therefore progressed with the rest of the data collection and analysis.

## Data collection techniques

Data for this research was collected using the structured questionnaire as an online tool through interview. The selected respondents were interviewed by research assistants identified and trained for the tasks to ensure consistency in data collected.

## Data analysis and presentation

Data from the online forms was downloaded into an excel form and checked for consistency. The data was the analyzed by both descriptive and inferential statistical and presented through percentages, charts and explained in continuous prose analysis was performed on the study's data collected. The independent variables' frequencies, means, and percentages were calculated against the demographic data using descriptive statistics. The independent and dependent variables' connections will be examined using the Pearson correlation coefficient. The study will employ regression analysis to evaluate the degree of correlation between the independent and dependent variables and to determine the collective influence of all independent variables on the dependent variable. The R2 will be used to gauge how well the model under consideration fits the data. Although this study will mainly collect quantitative data, any qualitative data will be coded and organized in themes to enable drawing of conclusion.

To examine the linear correlation between specific predictor variables and the dependent variable, the following linear regression models will be employed.

Y= β0+β1X1+ε................................................................................. **Equation 1**

Y = β0+β2X2+ ε............................................................................... **Equation 2**

Y= β0+β3X3+ ε............................................................................... **Equation 3**

A multiple linear regression model will be employed in this study to evaluate the collective impact and significance of multiple independent factors on the dependent variable. Below is the multiple linear regression model:

Y= β0+β1X1+β2X2+β3X3+ ε........................................ **Equation 4**

Where X1X2X3 are all the set of independent variables and Y is the dependent variable.

## Ethical Considerations in the Research Study

The study adhered to ethical principles through ensuring the right to privacy, where the respondents only gave information they felt free to give; anonymity by not requiring respondents to identify themselves; confidentiality by ensuring information given was not disclosed to any third parties; and informed consent by explaining the study's objectives to the respondents and letting them decide if they wanted to participate or not. The study adhered to guidelines provided by the graduate school as well as sought and was granted approval of NACOSTI to conduct the data collect process. The researcher did not use his position in the department of Agriculture, Makueni county to get unauthorized information and followed research guidelines all through.

# CHAPTER FOUR: DATA ANALYSIS AND FINDINGS

## Introduction

This chapter presents the empirical findings of the study on the effects of farmer socio-demographic factors on agricultural projects in Kenya with reference to NARIG project in Makueni County. An overview of data and variable analysis is provided in this chapter. With the support of a succinct narrative and an interpretation of the results, this chapter aims to evaluate, display, and interpret the data in figures, tables, and graphs.

## Response Rate

*Table 4.5: Response rate*

|  |  |  |  |
| --- | --- | --- | --- |
| **Ward** | **Sample** | **Returned** | **Percentage** |
| Kako | 99 | 81 | 82% |
| Mtito Andei | 119 | 119 | 100% |
| Tulimani | 63 | 59 | 94% |
| Thange | 128 | 92 | 72% |
| **Total** | **409** | **351** | **86%** |

Source: Author, (2023)

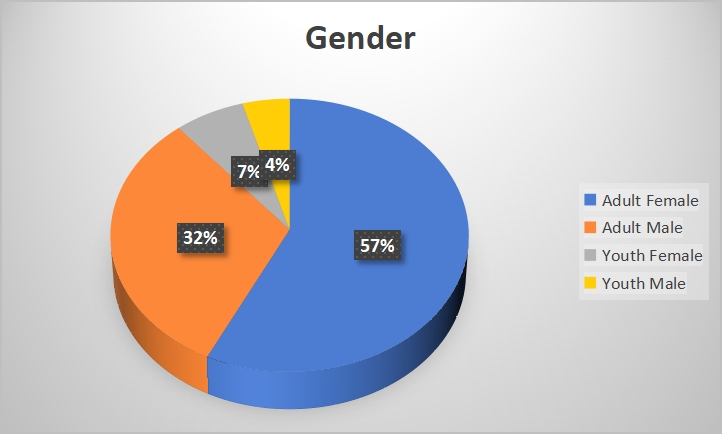
Out of a sample of 409 identified respondents, 351 which translated to 86% of the farmers were available to be interviewed by the research assistants. The 86% was sufficient according to Mugenda & Mugenda (2013) who indicated that 60% response rate is enough to make inference of the population.

## Demographic Information

This section provides the demographic information of the respondents.

### Gender of the respondents

*Figure 4.1: Gender*



Source (Author, 2023)

The study findings indicated that 57% of the respondents were adult female, 32% were adult male, 7% were youth female and 4% were youth male. These study findings are in line with a report by world bank. According to estimates from the World Bank (2014), women make up between 42% and 65% of the global agricultural labor force. Similar to this, there is a growing trend toward what has been dubbed the "feminization of agriculture" in many regions of the world today, including Kenya. Men moving from rural to urban areas in quest of paid job, either domestically or overseas, is one of the main causes of this phenomena. The role of women in agricultural production grows more important as males leave their rural homes (Adenugba, 2013). Women now make up about 50% of the agricultural labor force in Sub-Saharan Africa, up from about 45% in 1980. The averages in Africa, however, range from slightly over 40.

### Age of respondents

The mean age of the respondents was 52.23 years with a standard deviation of 13.684.

### Education level of the respondents

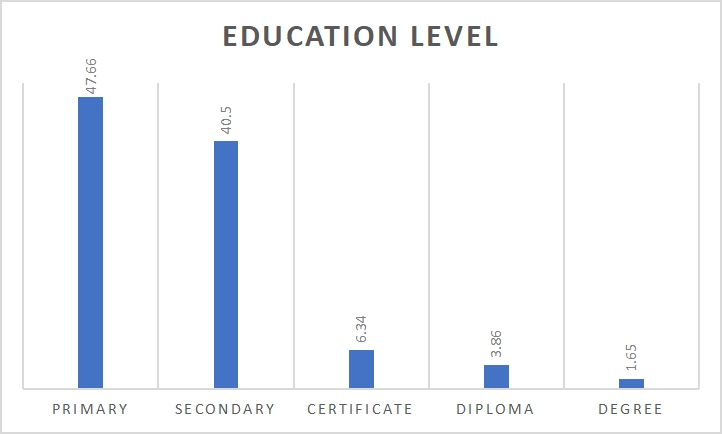


Figure 4.2: Education level

Source (Author, 2023)

### Level of income per month

The mean monthly income of the respondents was Ksh 9,995.18 with a standard deviation of 10,624.72.

### Size of the household

Table 4.2 *Household size*

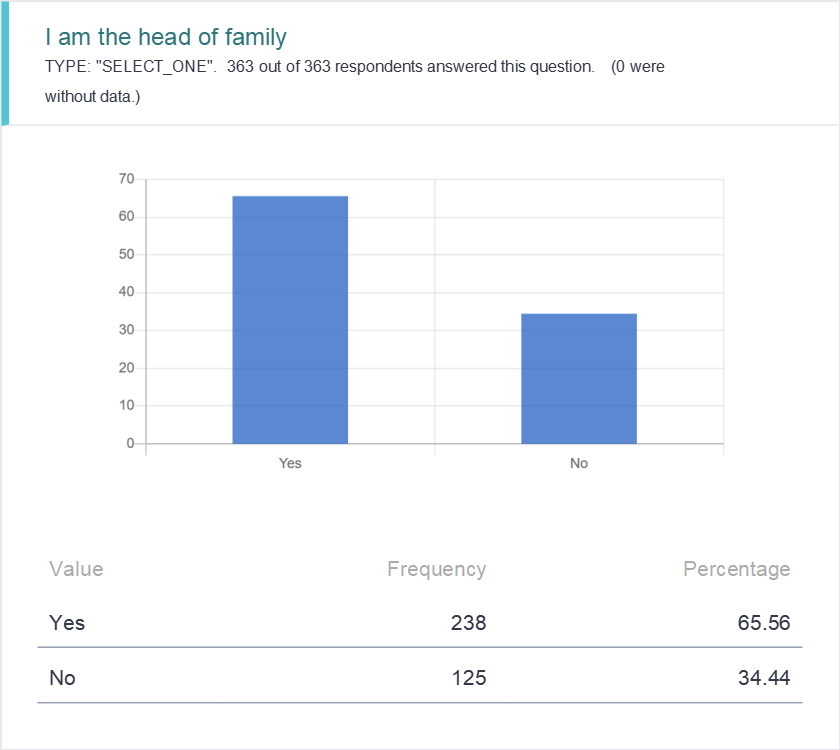
|  |  |  |
| --- | --- | --- |
| **HH Size** | **Frequency** | **Percent** |
| 1 | 18 | 5.0 |
| 2 | 36 | 9.9 |
| 3 | 61 | 16.8 |
| 4 | 78 | 21.5 |
| 5 | 61 | 16.8 |
| 6+ | 109 | 30.0 |
| **Total** | **363** | **100.0** |

Source (Author, 2023)

From the findings, 5% of the respondents were from a HH of one (1), 9.9 percent from HH of two (2), 16.8% from a HH of three (3), 21.5% from a HH of four (4), 16.8% from a HH of five (5) and 30% from a HH of six (6) or more.

### Family headship

### Figure 4.3: family headship



Source: (Author, 2023)

The study findings indicated that 66% of the respondents are the heads of families while 34% are not.

### Value chain

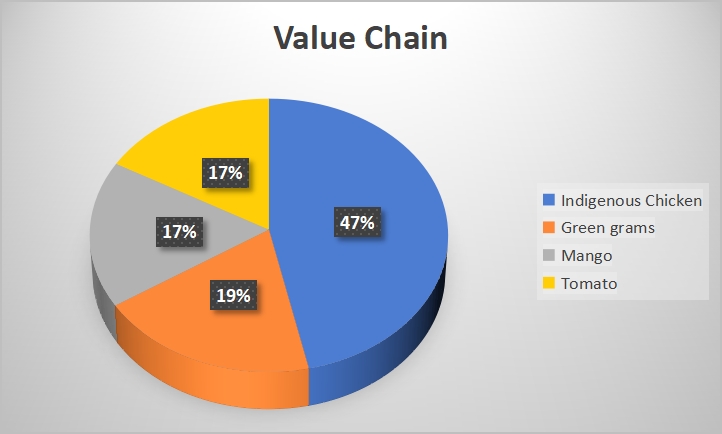


Figure 4.4: value chain

Source (Author, 2023)

The study findings indicated that 47% of the respondents rear indigenous chicken, 19% grow green grams, 17% grow mangos and 17% grow tomatoes.

### Experience in the value chain

The mean experience in the chosen value chains was 7.5973 years with a standard deviation of 6.826.

## Descriptive Statistics

### Farmer attitude

*Table 4.6: Descriptive statistics on farmer attitude*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Statement** | **Strongly Agree** | **Agree** | **Neutral** | **Disagree** | **Strongly Disagree** |
| I am skeptical about the success of the project due to past experience with other donor funded projects | 48.7% | 36.4% | 9.9% | 5% | 0 |
| There was adequate consultation at the project inception making me feel part of the project | 44.4% | 54.3% | 0.6% | 0.8% | 0 |
| I have fully embraced the project | 39.1% | 55.5% | 1.1% | 0.3% | 0 |
| I am happy with the approach to farmer training adopted by the project | 46.8% | 52.1% | 1.1% | 0 | 0 |
| I feel the project has good chances of success | 46% | 53.7% | 0.3% | 0 | 0 |
| I believe the project will be beneficial to me | 54.7% | 45.5% | 0.28% | 0 | 0 |
| The skills learned acquired through this project will ensure its sustainability. | 43.3% | 54.3% | 2.5% | 0 | 0 |
| The technology acquired through this project will ensure its sustainability | 41.6% | 51.5% | 6.9% | 0 | 0 |

Source (Author, 2023).

The study findings indicated that 48.7% of the respondents strongly agreed that they were skeptical about the success of the project due to past experience with other donor funded projects, 36.4% agreed, 9.9% were neutral and 5% disagreed. The findings indicated that 44.4% of the respondents strongly agreed that there had been adequate consultation at the project inception making them feel part of the project, 54.3% agreed, 0.6% were neutral and 0.8% disagreed. 39.1% of the respondents strongly agreed that they had fully embraced the project, 55.5% agreed, 1.1% were neutral and 0.3% disagreed. Further, the study findings indicated that 46.8% of the respondents strongly agreed that they were happy with the approach to farmer training adopted by the project, 52.1% agreed while 1.1% were neutral. The findings indicated that 46% of the respondents strongly agreed that the project had good chances of success, 53.7% agreed while 0.3% were neutral. The findings indicated that 54.7% of the respondents strongly agreed that they believed the project would be beneficial to them, 45.5% agreed while 0.28 were neutral. The findings indicated that 43.3% of the respondents strongly agreed that the skills learned and acquired through this project would ensure its sustainability, 54.3% agreed while 2.5% were neutral. The findings also indicated that 41.6% strongly agreed that the technology acquired through this project would ensure its sustainability, 51.5% agreed while 6.9% were neutral.

### Farmer knowledge

*Table 4.7: Descriptive statistics on farmer knowledge*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Statement** | **Strongly Agree** | **Agree** | **Neutral** | **Disagree** | **Strongly Disagree** |
| I understand the NARIG project objectives | 49% | 47.4% | 1.7% | 1,9% | 0 |
| I understand my value chain generally | 47% | 53% | 0 | 0 | 0 |
| I understand the good agricultural practices in my value chain | 46% | 53% | 0.8% | 0.2% | 0 |
| I understand the modern production technologies in my value chain | 42.2% | 49.8% | 6.3% | 1.7% | 0 |
| I have knowledge in product marketing in my value chain | 43% | 55.8% | 0.6% | 0.6% | 0 |

Source (Author, 2023)

49% of the respondents strongly agreed that they understood the NARIG project objectives, 47.4% agreed, 1.7% were neutral while 1.9% disagreed. 47% of the respondents strongly agreed that they understood their value chains generally while 53% agreed. On understanding good agricultural practices in their value chains, 46% of the respondents strongly agreed, 53% agreed, 0.8% were neutral while 0.2% disagreed. 42.2% of the respondents strongly agreed that they understood the modern production technologies in their value chains, 49.8% agreed, 6.3% were neutral while 1.7% disagreed. 43% of the respondents strongly agreed that they had knowledge in product marketing in their value chains, 55.8% agreed, 0.6% were neutral while 0.6% disagreed.

### Farmer practices

*Table 4.8: Descriptive statistics on farmer practices*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Statement** | **Strongly Agree** | **Agree** | **Neutral** | **Disagree** | **Strongly Disagree** |
| I practice mixed farming system | 44.9% | 52.7% | 0.8% | 0.3% | 0.3% |
| I operated large scale farming of my value chain before the project | 27.3% | 29.5% | 4.1% | 36.6% | 2.5% |
| I seek and utilize extension services | 43.5% | 53.1% | 1.5% | 0 | 0 |
| I seek and utilize credit for my farming enterprise | 38.3% | 38.6% | 9.6% | 13.5% | 0 |
| I am a full time farmer | 48.2% | 31.1% | 3.1% | 17.1% | 0.3% |

Source (Author, 2023)

The study findings indicated that 44.9% of the respondents strongly agreed that they practiced mixed farming, 52.7% agreed, 0.8% were neutral, 0.3% disagreed while 0.3% strongly disagreed. 27.3% of the respondents strongly agreed that they operated large scale farming of in their value chains before the project, 29.5% agreed, 4.1% were neutral, 36.6% disagreed while 2.5% strongly disagreed. 43.5% of the respondents strongly agreed that they sought and utilized extension services, 53.1% agreed while 1.5% were neutral. The findings indicated that 38.3% of the respondents strongly agreed that they sought and utilized credit for their farming enterprises, 38.6% agreed, 9.6% were neutral while13.5% disagreed. The findings indicated that 48.2% of respondents strongly agreed that they were full time farmers, 31.1% agreed, 3.15 were neutral, 17.1% disagreed while 0.3% strongly disagreed.

## Factor Analysis

### Sampling Adequacy Test

To check whether the data collected is adequate and suitable for descriptive and inferential statistical tests such as factor analysis, regression analysis and other statistical tests, Kaiser-Meyer-Olkin sample adequacy measures (KMO) was carried out.

Normally, 0 < KMO < 1

If KMO > 0.5, the sample is adequate. KMO = 0.715 - 0.912 which indicates that the sample is adequate and we may proceed with the Factor Analysis.

*Table 4.9: Kaiser-Meyer-Olkin (KMO)*

|  |  |
| --- | --- |
| **Variable** | **KMO** |
| Farmer attitude | 0.912 |
| Farmer knowledge | 0.868 |
| Farmer practice | 0.715 |
| Project Performance | 0.872 |

Source (Author, 2023)

### Factor Analysis

Factor analysis has been used to summarize data to make it more manageable without losing important information and thereby facilitating hypothesis testing. Factor loadings take values ​​between zero and one, with loadings below 0.40 being considered adequate. Findings in Table indicate that all the factor loading of all the items were above 0.4 and thus all were considered for further statistical analysis.

*Table 4.10: Factor Analysis*

|  |  |  |  |
| --- | --- | --- | --- |
| Variable | Minimum | Maximum | Average |
| Farmers attitude | 0.671 | 0.843 | 0.792 |
| Farmers knowledge | 0.746 | 0.857 | 0.814 |
| Farmers practice | 0.451 | 0.829 | 0.728 |
| Performance | 0.724 | 0.849 | 0.797 |

Source (Author, 2023)

## Diagnostic Tests

The diagnostic tests for the study variables are presented in this section. Normality, multicollinearity, and heteroscedasticity were among the tests. These tests are important because if any of these assumptions are violated, it can lead to biased and unreliable estimates of the regression coefficients. Therefore, it is important to carry out these tests before interpreting the results of a linear regression model.

### Normality Test

Normality tests are done to determine whether the sample data has been drawn from a normally distributed population. Normality assessment can be done by using a graphical or numerical procedure. The numerical procedures Kolmogorov-Smirnov and Shapiro-Wilk test where the null hypothesis is that the data is normal in distribution. All the p-values are greater than 0.05 hence we conclude that the variables are normally distributed.

*Table 4.11: Normality Tests*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Shapiro Wilk Test | | | Kolmogorov-Smirnov | | |
| Variable | Statistic | df | p-value | Statistic | df | p-value |
| Performance | 0.975 | 363 | 0.087 | 0.963 | 363 | 0.095 |

Source (Author, 2023)

### Test for Multicollinearity

In this study, multicollinearity was tested by computing the Variance Inflation Factors (VIF) and its reciprocal, the tolerance. VIF's greater than 10 are a sign of multicollinearity. The VIF is less than 10 indicating no multicollinearity is present.

*Table 4.12: Multicollinearity Test*

|  |  |  |
| --- | --- | --- |
| Variable | Tolerance | VIF |
| Farmers attitude | .296 | 3.383 |
| Farmers knowledge | .336 | 2.973 |
| Farmers practice | .415 | 2.409 |

Source (Author, 2023)

### Homoscedasticity Test

The P-value of the BP-LM test as shown in Table was greater than 0.05 implying that we fail to reject H0 and therefore conclude that the residuals do not exhibit heteroscedasticity thus meeting the homoscedasticity assumption.

*Table 4.13: Test for Heteroscedasticity*

|  |  |  |  |
| --- | --- | --- | --- |
|  | **LM** | **Sig** | **Conclusions** |
| BP | 8.998 | 0.320 | Fail to reject H0 |

Source (Author, 2023)

### Autocorrelation Test

The study used the Durbin-Watson test to test whether the residuals from the multiple linear regression models are independent. The acceptable Durbin Watson range is between 1.5 and 2.5. Durbin Watson value is 1.614, which is between the acceptable ranges, it shows that there were no autocorrelation problems.

*Table 4.14: Durbin Watson Test for Autocorrelation*

|  |
| --- |
| **Durbin-Watson Statistic** |
| 1.614 |

Source (Author, 2023)

## Inferential Analysis

In order to ascertain the link between the dependent and other study variables, correlation and regression analysis were employed in the inferential analysis.

### Correlation Analysis

***Table 4.15: Correlation Analysis***

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | | P | FA | FK | FP |
| P | Pearson Correlation | 1 |  |  |  |
| Sig. (2-tailed) |  |  |  |  |
| FA | Pearson Correlation | .762\*\* | 1 |  |  |
| Sig. (2-tailed) | .000 |  |  |  |
| FK | Pearson Correlation | .743\*\* | .799\*\* | 1 |  |
| Sig. (2-tailed) | .000 | .000 |  |  |
| FP | Pearson Correlation | .727\*\* | .744\*\* | .701\*\* | 1 |
| Sig. (2-tailed) | .000 | .000 | .000 |  |
| \*\*. Correlation is significant at the 0.01 level (2-tailed). | | | | | |

P = Performance, FA = Farmer Attitude, FK = Farmer Knowledge and FP = Farmer Practices

Source (Author, 2023).

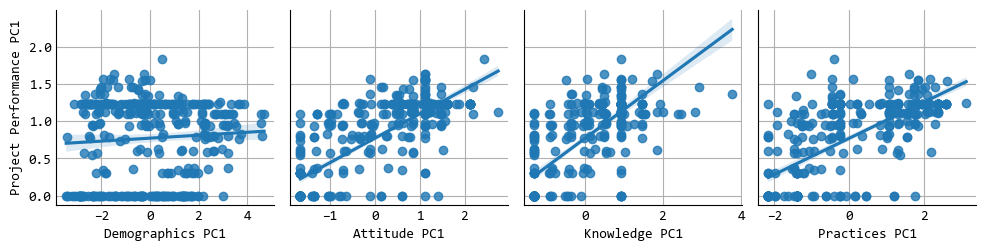


Figure 4.5: scatter plots

Source (Author, 2023)

These scatter plots represent the relationship between "Project Performance PC1" and four other principal components: "Demographics PC1," "Attitude PC1," "Knowledge PC1," and "Practices PC1."

**Demographics vs. Project Performance**: There's a weak and somewhat scattered correlation, with the regression line being almost horizontal. This suggests that demographics have a minimal influence on project performance.

**Attitude vs. Project Performance**: There's a moderate positive correlation, as shown by the upward slope of the regression line. This indicates that as attitude scores increase, project performance tends to improve.

**Knowledge vs. Project Performance**: A stronger positive correlation is observed here, with the regression line clearly slanting upwards. This suggests that higher knowledge scores are associated with better project performance.

**Practices vs. Project Performance**: Similarly, there's a positive correlation between practices and project performance. The regression line indicates that better practices relate to improved project outcomes.

**Overall Interpretation**: The data suggests that "Attitude," "Knowledge," and "Practices" are strong determinants of project performance. In contrast, “Demographics” have a negligible influence on project outcomes based on the analyzed principal components. There is some correlation between "Attitude" and "Knowledge" and also between “Practices”, “Attitude” and “Knowledge” which might indicate some shared underlying factors or aspects between these three components.

### 4.7.2 Regression Analysis

#### 4.7.2.1 Regression Analysis of farmer’s profile and productivity

The study first objective was to examine the influence of farmer’s profile on productivity.

**Gender**

*Table 4.16: Model summary on gender and productivity*

|  |  |  |  |
| --- | --- | --- | --- |
| Model | R | R Square | Adjusted R Square |
|  | .1634 | .0267 | .0186 |

According to the results in Table, gender has a R squared of 0.0267, meaning that gender accounts for 2.67% of the variability in productivity.

*Table 4.17: ANOVA Statistics (Gender and productivity)*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Model | | | Sum of Squares | df | Mean Square | F | Sig. |
|  | Regression | 2.082 | 3 | 0.676 | 3.29 | .0209 |
| Residual | 73.87 | 359 | 0.205 |  |  |
| Total | 75.898 | 362 |  |  |  |

The findings on the ANOVA as shown in Table indicates that (F = 3.29, p=0.0209 <0.05). The results imply that the model summary was statistically significant. The findings reveal that gender was statistically significant in explaining productivity.

*Table 4.18: Regression Coefficients (gender and productivity)*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Model | | Unstandardized Coefficients | | t | Sig. |
| B | Std. Error |
|  | (Constant) | 4.364 | .0314 | 138.77 | .000 |
| Adult Male | .076 | .052 | 22.343 | .149 |
|  | Youth Female | -.045 | .097 | -0.460 | .645 |
|  | Youth Male | .333 | .117 | 2.83 | .005 |
|  | Adult Female (Ref) |  |  |  |  |

Based on the regression coefficients presented in Table, it was determined that there was a statistically significant positive link (beta coefficient of β = 0.333 and p = 0.000<0.05) between Youth male and productivity.

The regression equation is given as:

Y = Productivity

**Age**

*Table 4.19: Model summary on Age and productivity*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|  | .096 | .009 | .007 | .45639 |

According to the results in Table, age has a R squared of 0.009, meaning that it accounts for 0.9% of the variability in productivity at the county.

*Table 4.20: ANOVA Statistics (Age and productivity)*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Model | | | Sum of Squares | df | Mean Square | F | Sig. |
| 1 | Regression | .707 | 1 | .707 | 3.392 | .066 |
| Residual | 75.192 | 361 | .208 |  |  |
| Total | 75.899 | 362 |  |  |  |

The findings on the ANOVA as shown in Table indicates that (F = 3.392, p=0.000 <0.05). The results imply that the model summary was statistically insignificant.

**Education**

*Table 4.21: Model summary on farmer’s education level and productivity*

|  |  |  |  |
| --- | --- | --- | --- |
| Model | R | R Square | Adjusted R Square |
|  | .1634 | .0175 | .0065 |

According to the results in Table, education has a R squared of 0.0175, meaning that it accounts for 1.75% of the variability in productivity.

*Table 4.19 ANOVA Statistics (Education Level and productivity)*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Model | | | Sum of Squares | df | Mean Square | F | Sig. |
|  | Regression | 1.328 | 4 | 0.332 | 1.59 | 0.017 |
| Residual | 74.569 | 358 | 0.208 |  |  |
| Total | 75.898 | 362 |  |  |  |

The findings on the ANOVA as shown in Table indicates that (F = 1.59, p=0.1751 > 0.05). The results imply that the model summary was statistically insignificant. The results are different from those of Obierio (2013), who discovered that in Siaya County, there is a negative correlation of -0.075 between maize output and education, indicating a negative relationship between education and farm yield. These results are consistent with those of Evenson and Mwabu (1998), who discovered that education has a favorable but statistically insignificant impact on farm production.

**Level of income**

*Table 4.20: Model summary on farmers’ level of income and productivity*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Model |  | R | R Square | Adjusted R Square | Std. Error of the Estimate |
| 1 |  | .099a | .010 | .007 | .45625 |

According to the results in Table, level of income has a R squared of 0.010, meaning that it accounts for 1% of the variability in productivity.

*Table 4.21 ANOVA Statistics (Household Income and productivity)*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Model | | | Sum of Squares | df | Mean Square | F | Sig. |
| 1 | Regression | .751 | 1 | .751 | 3.606 | .058b |
| Residual | 75.148 | 361 | .208 |  |  |
| Total | 75.899 | 362 |  |  |  |

Source (Author, 2023)

The findings on the ANOVA as shown in Table indicates that (F = 3.606, p=0.058 >

0.05). The results imply that the model summary was statistically insignificant. These findings are in line with a study done by Diaz (2022) which indicated that the household income does not influence agricultural productivity. Whether the income is from other sources or from the agricultural practices, the influence was statistically insignificant.

#### 4.7.2.2 Regression Analysis of farmer’s attitude and productivity

The study second objective was to examine the influence of farmers’ attitude on productivity.

*Table 4.22: Model summary on farmers’ attitude and productivity*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|  | .762 | .580 | .579 | .29704 |

Source (Author, 2023)

According to the results in Table, farmers’ attitude has a R squared of 0.580, meaning that it accounts for 58.0% of the variability in productivity at the counties. These study findings are in line with a study done by Sadati (2010) which found out that the 73.4% of the farmers had moderate attitide towards sustainable agricultural practices which accounted for 46.3% of the variability in productivity.

*Table 4.23: ANOVA Statistics (Farmers attitude and productivity)*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Model | | | Sum of Squares | df | Mean Square | F | Sig. |
|  | Regression | 44.047 | 1 | 44.047 | 499.215 | .000 |
| Residual | 31.852 | 361 | .088 |  |  |
| Total | 75.899 | 362 |  |  |  |

Source (Author, 2023)

The findings on the ANOVA as shown in Table indicates that (F = 499.215, p=0.000 <0.05). The results imply that the model summary was statistically significant. The findings reveal that farmer’s attitude was statistically significant in explaining productivity.

*Table 4.24: Regression Coefficients (Farmers attitude and productivity)*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Model | | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
| B | Std. Error | Beta |
|  | (Constant) | .974 | .154 |  | 6.322 | .000 |
| Farmers attitude | .775 | .035 | .762 | 22.343 | .000 |

Based on the regression coefficients presented in Table, it was determined that there was a statistically significant positive link (beta coefficient of β = 0.775 and p = 0.000<0.05) between farmer’s attitude and productivity. The findings suggest that productivity will increase by 0.775 units for every unit increase in farmer’s attitude, all other things being kept constant.

The regression equation is given as:

Y = Productivity and X1 is Farmers attitude.

#### 4.7.2.3 Regression Analysis of farmer’s knowledge and productivity

The study second objective was to examine the influence of farmer’s knowledge on productivity.

*Table 4.25: Model summary on farmer’s knowledge and productivity*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|  | .743 | .553 | .551 | .30673 |

According to the results in Table, farmer’s knowledge has a R squared of 0.553, meaning that it accounts for 55.3% of the variability in productivity at the county. The findings are in line with a study done by Mukhisa (2019) who stated that farmers’ knowledge has an influence on the agricultural productivity. The findings indicate that farmers who continually get trainings on the good agricultural practices have recorded a 43.2% increase in their farm productivity.

*Table 4.26: ANOVA Statistics (Farmers knowledge and productivity)*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Model | | | Sum of Squares | df | Mean Square | F | Sig. |
|  | Regression | 41.936 | 1 | 41.936 | 445.741 | .000 |
| Residual | 33.963 | 361 | .094 |  |  |
| Total | 75.899 | 362 |  |  |  |

Source (Author, 2023)

The findings on the ANOVA as shown in Table indicates that (F = 445.741, p=0.000 <0.05). The results imply that the model summary was statistically significant. The findings reveal that farmer’s knowledge was statistically significant in explaining productivity.

*Table 4.27: Regression Coefficients (Farmers knowledge and productivity)*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Model | | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
| B | Std. Error | Beta |
|  | (Constant) | 1.171 | .154 |  | 7.611 | .000 |
| Farmers knowledge | .732 | .035 | .743 | 21.113 | .000 |

Based on the regression coefficients presented in Table, it was determined that there was a statistically significant positive link (beta coefficient of β = 0.732 and p = 0.000<0.05) between farmer’s knowledge and productivity. The findings suggest that productivity will rise by 0.732 units for every unit increase in farmer’s knowledge, all other things being kept constant.

The regression equation is given as:

Y = Productivity and X2 is Farmers knowledge.

#### 4.7.2.4 Regression Analysis of farmers practice and productivity

The study fourth objective was to examine the influence of farmers practice on productivity.

*Table 4.28: Model summary on farmers practice and productivity*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
| 1 | .727a | .529 | .527 | .31478 |

Source (Author, 2023)

According to the results in Table, farmers practice has a R squared of 0.529, meaning that it accounts for 52.9% of the variability in productivity. These findings are in line with study done by Njoroge (2020) which indicated that agricultural productivity and extension service delivery have a positive association of 0.169. The farmers’ practices such as seeking credit services and being full time farmers’ have a positive influence on farmer productivity.

*Table 4.29: ANOVA Statistics (Farmers practice and productivity)*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Model | | | Sum of Squares | df | Mean Square | F | Sig. |
|  | Regression | 40.129 | 1 | 40.129 | 404.994 | .000 |
| Residual | 35.770 | 361 | .099 |  |  |
| Total | 75.899 | 362 |  |  |  |

Source (Author, 2023)

The findings on the ANOVA as shown in Table indicates that (F = 404.994, p=0.000 <0.05). The results imply that the model summary was statistically significant. The findings reveal that farmers practice was statistically significant in explaining productivity.

*Table 4.30: Regression Coefficients (Farmers practice and productivity)*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Model | | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
| B | Std. Error | Beta |
|  | (Constant) | 2.208 | .110 |  | 20.038 | .000 |
| Farmers practice | .535 | .027 | .727 | 20.124 | .000 |

Source (Author, 2023)

Based on the regression coefficients presented in Table, it was determined that there was a statistically significant positive link (beta coefficient of β = 0.732 and p = 0.000<0.05) between farmers practice and productivity. The findings suggest that productivity will rise by 0.732 units for every unit increase in farmers practice, all other things being kept constant.

The regression equation is given as:

Y = Productivity and X3 is Farmers practice.

### 4.7.3 Overall Regression Model

According to the results in Table, farmers’ profile, farmers’ knowledge, farmers’ attitude and farmers’ practices has a R squared of 0.66, meaning that it accounts for 66.6% of the variability in productivity.

*Table 4.31: Model summary on farmers practice and productivity*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
| 1 | .816a | .666 | .663 | .26588 |

Source (Author, 2023)

Table 4.32: ANOVA Statistics

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Model | | | Sum of Squares | df | Mean Square | F | Sig. |
| 1 | Regression | 50.519 | 3 | 16.840 | 238.204 | .000b |
| Residual | 25.379 | 359 | .071 |  |  |
| Total | 75.899 | 362 |  |  |  |

s

Source (Author, 2023)

The findings on the ANOVA as shown in Table indicates that (F = 238.204, p=0.000 <0.05). The results imply that the model summary was statistically significant.

Table 4.33: Regression Coefficients 1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Model | | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
| B | Std. Error | Beta |
| 1 | (Constant) | .855 | .146 |  | 5.872 | .000 |
| X1 | .322 | .057 | .317 | 5.642 | .000 |
| X2 | .282 | .052 | .287 | 5.446 | .000 |
| X3 | .214 | .035 | .291 | 6.135 | .000 |

Source (Author, 2023)

The regression equation is given as:

Y = Productivity X1 is Farmers attitude, X2 is Farmers knowledge and X3 is Farmers practice.

# CHAPTER FIVE: SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

## Introduction

This chapter provides the summary of findings, conclusion and recommendations of the study.

## Summary of findings

This section will provide a summary of findings as per the study objectives.

### Demographic information

The study findings indicated that 57% of the respondents were adult female, 32% were adult male, 7% were youth female and 4% were youth male. The mean age of the respondents was 52.23 years. The study findings indicated that 47.66% of the respondents have primary level of education, 40.5% have secondary level, 6.34% have certificate level of education, 3.86% have diplomas while 1.65% have a bachelor’s degree. The mean monthly income of the respondents was Ksh 9,995.18. the study indicated that 5% of respondents were one-person household, 9.9% were from household of two, 16.8% from household of three, 21.5% from household of four, 16.8% from household of five and 30% from household of six or more. The study findings indicated that 66% of the respondents are the heads of families while 34% are not family heads. The study findings indicated that 47% of the respondents rear indigenous chicken, 19% grow green grams, 17% grow mangos and 17% grow tomatoes. The mean experience in the adopted value chains is 7.5973 years.

### Summary of farmer profile

The study findings indicate that gender accounts for 2.67% of the variability in productivity. The findings indicate that gender was statistically significant in explaining productivity. The study findings indicated that age account for 0.9% of the variability in productivity. The findings indicated that age is not statistically significant in explaining productivity. The study findings indicate that education accounts for 1.75% of the variability in productivity. The results indicate that education is statistically insignificant in explaining productivity. The findings indicated that level of income account for 1% of the variability in productivity. The results indicated that level of income was statistically insignificant in explaining agricultural productivity. Overall, farmer demographics play no significant role in the agricultural productivity in NARIG project in Makueni County.

### Summary of farmer attitude

The study findings indicated that farmers’ attitude account for 58% of the variability in agricultural productivity. The findings indicated that farmer attitude is statistically significant in explaining agricultural productivity. The regression equation indicate that productivity will rise by 0.775 units for every unit increase in farmers’ attitude.

### Summary of farmer knowledge

The study findings indicated that farmer knowledge account for 55.3% of the variability in productivity at the county. The findings indicate that farmer knowledge is statistically significant in explaining agricultural productivity. The regression equation indicate that productivity will rise by 0.732 units for every unit increase in farmer’s knowledge.

### Summary of farmer practices

The study findings indicate that farmer practices explain 52.9% of the variability in agricultural productivity. The findings indicated that farmer practices were statistically significant in explaining productivity. The findings indicated that farmer practices are statistically significant in explaining agricultural productivity. The regression equation suggest that productivity will rise by 0.732 units for every unit increase in farmers practices.

## Conclusions

The conclusions of the study include the following; gender has a positive significance influence on agricultural productivity. This is because of the gender roles and the gender gaps in the agricultural sector which play a critical role in determining the level of agricultural productivity. The education level does not have an influence on the agricultural productivity since the farmers can gain knowledge about the value chains despite their education levels. Level of income is statistically insignificant in explaining the agricultural productivity since the value chains are less capital intensive and the project provides the seed capital required to start the value chain. Farmers attitude influence agricultural productivity since the farmers have been trained, they have embraced the project and the project has yielded benefits to the farmers. Farmer knowledge influence agricultural productivity since the farmers have knowledge on the enterprise, good agricultural practices, modern production technologies and the marketing of the projects. Farmer practices influence agricultural productivity. Thus, the success of agricultural projects is likely to be affected by farmers’ attitude, knowledge and practices.

## Recommendations

The following are the recommendations from the findings of this study.

### Policy makers

Policy makers who are formulating agricultural projects and programmes should take into account the attitude towards the projects by the potential beneficiary farmers, the knowledge level of the farmers and type of practices by the farmers.

### Researchers

Researchers have been provided with additional empirical literature in the field of study and some can further interrogate these results with a view of identifying which is the most critical factor in the success of agricultural development programmes and projects.

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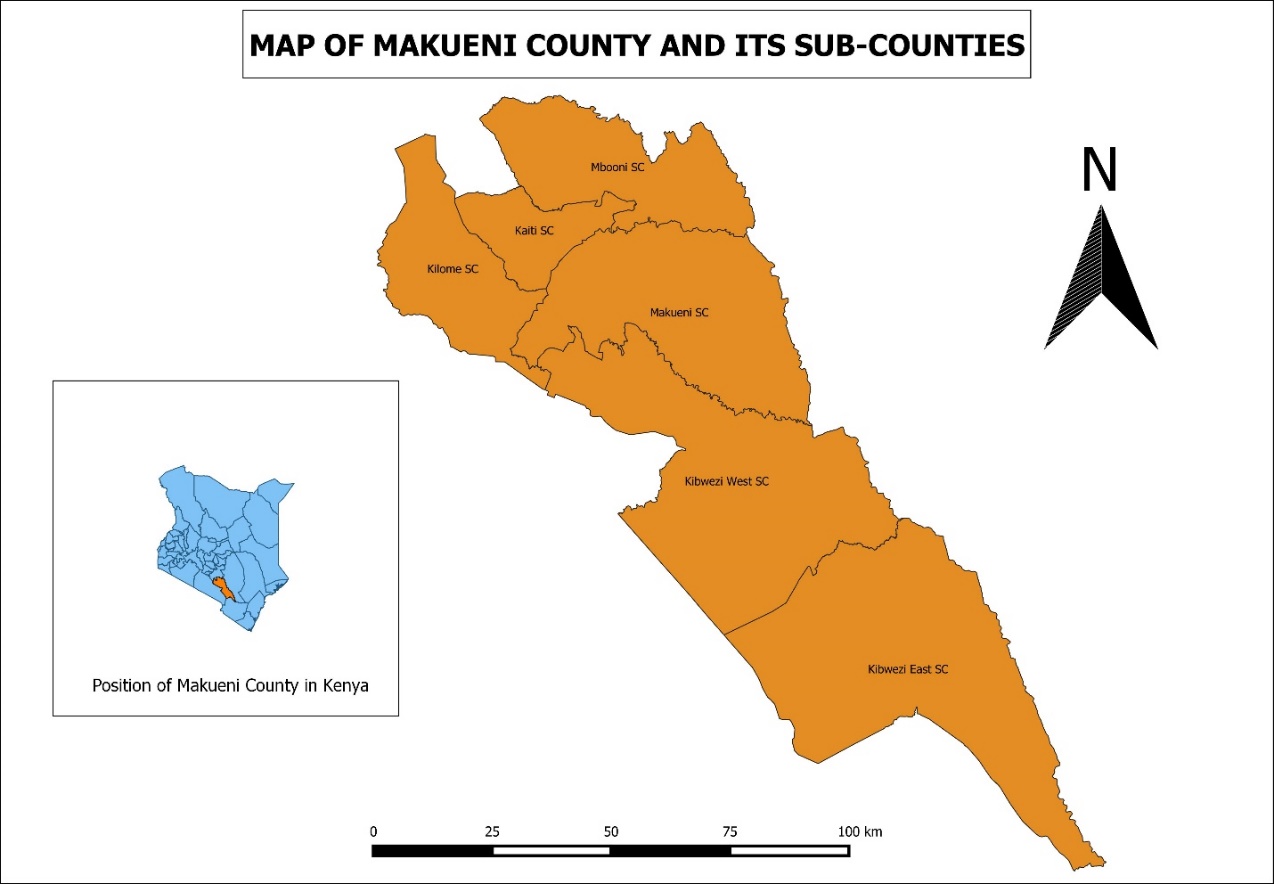
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# A1: MAKUENI COUNTY ADMINISTRATIVE BOUNDARIES AND POSITION IN KENYA



# 

# A2: RESEARCH INSTRUMENTS

**SECTION ONE: FARMER DEMOGRAPHIC CHARACTERISTICS**

1. **Gender**

Male ( )

Female ( )

1. **Age**

State your age in years --------------

1. **Level of education**

Primary ( )

Secondary ( )

Certificate ( )

Diploma ( )

Degree ( )

1. **Level of income per month**

Below Ksh. 5,000 ( )

Ksh 5,000 – 10,000 ( )

Ksh. 10,000 – 30,000 ( )

Ksh. 30,000 – 50,000 ( )

Ksh. 50,000 – 100,000 ( )

Above Ksh. 100,000 ( )

1. **Size of household**

State number of persons in the household ----------------

1. **I am the head of family**

Yes ( )

No ( )

1. **Value chain**

Indigenous chicken ( )

Green gram ( )

Mango ( )

Tomato ( )

1. **Experience in the value chain**

Less than 1 year ( )

1-3 years ( )

4 – 5 years ( )

Over 5 years (

**SECTION TWO: FARMER ATTITUDE**

**In a scale of 1 -5 rate your level of agreement with the statements (1 - Strongly Disagree, 2 - Disagree, 3 - Neutral, 4 - Agree, 5 - Strongly agree)**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Statement** | **1** | **2** | **3** | **4** | **5** |
|  | I am skeptical about the success of the project due to past experience with other donor funded projects. |  |  |  |  |  |
|  | There was adequate consultation at the project inception making me feel part of the project. |  |  |  |  |  |
|  | I have fully embraced the project |  |  |  |  |  |
|  | I am happy with the approach to farmer training adopted by the project |  |  |  |  |  |
|  | I feel the project has good chances of success |  |  |  |  |  |
|  | I believe the project will be beneficial to me |  |  |  |  |  |
|  | The skills and technology learned through this project will ensure its sustainability. |  |  |  |  |  |

**SECTION THREE: FARMER KNOWLEDGE OF PROJECT AND ENTERPRISE**

Which of the following aspects are you knowledgeable about? Tick all that apply (Farmer is considered knowledgeable if he/she has scored at least three out of the five)

1. The NARIG project objectives ( )
2. The enterprise generally ( )
3. Good agricultural practices ( )
4. Modern production technologies ( )
5. Product Marketing ( )

**SECTION FOUR: FARMER PRACTICES**

Answer yes of no for the following questions

In a scale of 1 -5 rate your level of practice for the following farm practices (1 – Fully practice, 2 – Practice to a great extent, 3 – Practice to some extent, 4 – there is some attempt to practice, 5 – Do not practice at all)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Statement** | **1** | **2** | **3** | **4** | **5** |
|  | I practice mixed farming system |  |  |  |  |  |
|  | I operated a large scale farming on my enterprise before the project |  |  |  |  |  |
|  | I seek and utilise extension services |  |  |  |  |  |
|  | I seek and utilise credit for my farming enterprise |  |  |  |  |  |
|  | I am a full time farmer |  |  |  |  |  |

**SECTION FIVE: PERFORMANCE OF THE NARIGP PROJECT**

1. Measuring productivity and profitability for crop enterprises (for respondents who are doing green grams, tomatoes or mangos)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Item of measurement | Unit of measurement | Status before project | Status after project |
|  | Productivity | Acreage/number of trees(for mangos) |  |  |
| Production per acre/tree |  |  |
|  | Profitability | Price per Kg/Piece in Ksh |  |  |
|  | New sources of income | Income earned per year in thousands of shillings |  |  |
|  | Employment creation | Number of employees |  |  |

1. Measuring productivity and profitability for poultry enterprises (for respondents who are doing poultry farming)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Item of measurement | Unit of measurement | Status before project | Status after project |
|  | Productivity | Number of chicken kept |  |  |
| Number of production cycles per year |  |  |
|  | Profitability | Price per chicken |  |  |
|  | New sources of income | Income earned per year in thousands of shillings |  |  |
|  | Employment creation | Number of employees |  |  |

1. Adoption of TIMPS

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Enterprise(s) | Technology | Trained | Adopted |
|  | Crop | Certified seed/Seed system |  |  |
| Improved varieties |  |  |
| Integrated pest and disease management |  |  |
| Agronomic practices |  |  |
| Soil fertility management |  |  |
| Soil moisture conservation |  |  |
| Post-harvest handling |  |  |
| Value addition |  |  |
|  | Poultry | New improved breeds |  |  |
| Poultry housing |  |  |
| Feeds |  |  |
| Feeding and watering equipment |  |  |
| Hatching and brooding management |  |  |
| Vaccination |  |  |
| Manure management/Hygiene management |  |  |

1. Overall rating of project performance

**In a scale of 1 -5 rate your level of agreement with the statements (1 - Strongly Disagree, 2 - Disagree, 3 - Neutral, 4 - Agree, 5 - Strongly agree)**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Statement** | **1** | **2** | **3** | **4** | **5** |
|  | NARIGP project objectives have generally been achieved |  |  |  |  |  |
|  | Farm productivity of farms has increased since inception of NARIGP project |  |  |  |  |  |
|  | The implementation of the NARIGP project has been timely |  |  |  |  |  |
|  | NARIGP project has given me new sources of income |  |  |  |  |  |
|  | NARIGP project has led to employment creation |  |  |  |  |  |
|  | Socially excluded groups have been incorporated into the project |  |  |  |  |  |

# a3: nacosti authorization to collect data

