

**CONTRIBUTION OF FOREIGN AID ON DEVELOPMENT OF IRRIGATION
SCHEMES IN TANZANIA: CASE OF DAKAWA IRRIGATION SCHEME,
MOROGORO**

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**A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE
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2024

CERTIFICATION

The undersigned certifies that he has read and hereby recommends for acceptance by the Open University of Tanzania, a dissertation entitled; “Contribution of Foreign Aid on Development of Dakawa Irrigation Scheme in Morogoro, Tanzania” for the award of the Master of International Cooperation and Development of the Open University of Tanzania

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.....

Date

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I, **Erasto Issack Gowelle**, declare that, the work presented in this dissertation is original. It has never been presented to any other University or Institution. Where other people's works have been used, references have been provided. It is in this regard that I declare this work as originally mine. It is hereby presented in partial fulfilment of the requirement for the Degree of the Master of International Cooperation and Development of the Open University of Tanzania

.....

Signature

.....

Date

DEDICATION

This work is dedicated to my lovely mother Theresa Sanga for her great support and tirelessly sacrifices that has made me reach this milestone.

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I wish to express my sincere gratitude to the almighty God for giving me this great opportunity to produce this document. I wish also to put forth thanks to my supervisor Prof. Deus Ngaruko whose intellectual stimulation, guidance, directives and valuable comments have enable me to attain this research.

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ABSTRACT

This study examines the impact of foreign aid on the development of the Dakawa Irrigation Scheme in Mvomero District, Morogoro Region, Tanzania, addressing the broader need to improve agricultural productivity through infrastructure and capacity building in resource-limited areas. The research problem centers on understanding how foreign aid contributes to irrigation schemes' development and management sustainability, given the lack of comprehensive data in this area. This mixed-methods study employed both quantitative and qualitative approaches. Quantitative data were collected through structured questionnaires distributed to a representative sample of farmers, while qualitative insights were obtained from interviews with key stakeholders, including board members and local authorities. The sampling techniques ensured a diverse and representative participant pool. Analysis revealed that foreign aid significantly enhanced farmers' skills, improved irrigation infrastructure—including the development of a 2,000-hectare farm and the construction of essential facilities such as canals, routes, and pumps—and supported management functions related to water and land rights. Statistical tests ($p < 0.05$) indicated notable improvements in paddy yield and land cultivated per season post-intervention. The study concludes that foreign aid plays a critical role in enhancing infrastructure, management practices, and farmer capacities, though challenges such as the need for a water reservoir, canal extensions, and market access persist. Future research should explore the effectiveness of institutional coordination between stakeholders and identify factors that impact the sustainability of foreign-funded irrigation projects in Tanzania.

Keywords: *Foreign Aid, Irrigation Schemes, Agricultural Development, Dakawa, Irrigation Scheme, Farmer Capacitation, Infrastructure Development, Tanzania Agriculture*

TABLE OF CONTENTS

CERTIFICATION	I
COPYRIGHT	II
DECLARATION.....	III
DEDICATION.....	IV
ACKNOWLEDGEMENTS.....	V
ABSTRACT.....	VI
TABLE OF CONTENTS.....	VII
LIST OF TABLES	XIII
LIST OF FIGURES	XIV
LIST OF ABBREVIATIONS AND ACRONYMS	xv
CHAPTER ONE	1
INTRODUCTION.....	1
1.1 Background Information	1
1.2 Research Problem Statement.....	4
1.3 Research Objectives	6
1.3.1 Main Objective.....	6
1.3.2 Specific Objectives.....	6
1.4 Research Questions	7
1.5 Justification of the Problem	7
1.6 Significance of the Study	8
CHAPTER TWO	10
LITERATURE REVIEW.....	10
2.1 Chapter Overview	10

2.2	Conceptual Definitions.....	10
2.2.1	A donor	10
2.2.2	Foreign Aid	10
2.2.3	Development of Irrigation Scheme	11
2.2.3.1	Formulation Stage	11
2.2.3.2	Implementation Stage.....	11
2.2.3.3	Operation and Maintenance Stage	12
2.2.3.4	Training Stage	12
2.3	Theoretical Literature Review.....	12
2.3.1	Historical Background UWAWAKUDA.....	15
2.3.2	Paddy Production Before the Project	16
2.3	Empirical Literature Review	17
2.3.1	Irrigation Infrastructure Funded by Foreign Aid	17
2.3.2	Role of Foreign Aid at the Management System of Irrigation Scheme	19
2.3.3	Role of Foreign Aid on Farmer Capacitation.....	21
2.4	Knowledge Gap.....	23
2.5	Conceptual Framework	24
	CHAPTER THREE	26
	RESEARCH METHODOLOGY	26
3.1	Chapter Overview	26
3.2	Research Approach	26
3.3	Research Design.....	26
3.4	Study Area.....	27

3.5	Target Population	28
3.6	Sampling Design and Sample Size	28
3.6.1	Sample Size.....	28
3.6.2	Sampling Procedures.....	29
3.6.2.1	Sampling of Dakawa Irrigators Cooperative Union.....	29
3.6.2.2	Sampling Dakawa Irrigation Scheme Board Members.....	30
3.6.2.3	Sampling Director of Dakawa Irrigation Scheme	30
3.7	Data Collection Instruments.....	30
3.7.1	The Farmers Questionnaires for Dakawa Irrigators Cooperative Union	31
3.7.2	Interview for Dakawa Irrigation Scheme Board Members	31
3.8	Validity and Reliability of Research Instruments	32
3.8.1	Validity of Research Instruments.....	32
3.8.2	Reliability of Research of Instruments.....	34
3.9	Data Analysis Procedures	34
3.9.1	Analysis of Quantitative Data	34
3.9.2	Analysis of Qualitative Data	34
3.10	Research Ethical Considerations.....	34
	CHAPTER FOUR.....	36
	RESULT AND DISCUSSIONS	36
4.1	Chapter Overview	36
4.2	Respondents Characteristics.....	37
4.2.1	Respondents Sex	37
4.2.2	Respondents Age.....	38

4.2.3	Education Levels of Respondents	39
4.3	The Support from the Donors	41
4.3.1	Media of Accessing Information from Donors	41
4.3.2	The Areas Supported by Donor Funds.....	42
4.3.3	Development Partners' Contributions to the Scheme	43
4.3.4	The Contribution of Foreign Aid on Irrigation Infrastructures at Dakawa Irrigation Scheme	44
4.3.5	The Irrigation Infrastructures Improved by Foreign Aid	45
4.3.6	The Extent Foreign Aid Have Improved Scheme Intake	46
4.3.7	The Extent at which Foreign Aid have Improved Water Pumps	48
4.4	The Extent that Foreign Aid have Improved Secondary Canals.....	52
4.4.1	The Extent that Foreign Aid have Improved Secondary Canal's Gets	54
4.4.2	The Extent that Foreign Aid have Improved Farms Routes	55
4.4.3	The Extent that Foreign Aid have Improved Scheme Roads.....	57
4.4.4	The Contribution of Foreign Aid on Farmers' Capacitation at Dakawa Irrigation Scheme	58
4.5	Training Supporters.....	59
4.5.1	Areas to which Trainings Focused.....	61
4.5.2	Agricultural Activities Improved Due to The Trainings.....	62
4.6	Number of Cultivations Per Season	63
4.6.1	Reasons for Cultivating Once Per Season.....	64
4.6.2	Facilitations Required in Order to Cultivate More Than One Season	65
4.6.2.1	Land size cultivated before the project	66

4.6.3	Number of Bags (7tins) Produced Before Project.....	67
4.6.4	Agricultural Practices before the Project	68
4.6.5	The Size of Land Cultivated after the Project	69
4.6.6	Number of Bags (7 tins) Produced after the Project	71
4.6.7	Comparison on Paddy Production before and after the Project	71
4.6.8	Paddy Production and Productivity.....	73
4.6.9	The Achievements Attained Through the Trainings	74
4.6.10	Accessing Agricultural Inputs.....	75
4.6.11	Access to Finance.....	76
4.7	The Role of Foreign aid in UWAWAKUDA'S Management System at the Dakawa Irrigation Scheme	76
4.7.1	Maintenance and Rehabilitation.....	78
4.7.2	Water Rights and Land Rights	78
4.7.3	Allocation of Foreign Aids	79
4.7.4	The Challenges Facing Dakawa Irrigation Scheme	80
	CHAPTER FIVE.....	82
	CONCLUSION AND RECOMMENDATIONS.....	82
5.1	Chapter Overview	82
5.2	Conclusion	82
5.3	Recommendations	84
5.3.1	Recommendations to the Ministry of Agriculture	84
5.4	Recommendations for Further Studies.....	87
	REFERENCES.....	89
	APPENDICES	93

LIST OF TABLES

Table 2.1: Paddy Production and Productivity for the Past Nine Years (from 2014 to 2022)	17
Table 2.2: Conceptual Framework	25
Table 4.1: Summary of Education Levels of Respondents	40
Table 4.2: Support from the Donors	41
Table 4.3: Media of Accessing Information from Donors	42
Table 4.4: Development Partners Support the Scheme.....	44
Table 4.5: The extent that Foreign Aid have improved irrigation infrastructure (N=74; figures in percentages).....	45
Table 4.6: Improved Scheme intake due to Foreign Aid	48
Table 4.7: The Extent that foreign aid have Improved Water Pumps.....	49
Table 4.8: The Extent that Foreign Aid have Improved Main Canal.....	51
Table 4.9: Foreign Aid have Improved Secondary Canals	52
Table 4.10: The Extent that Foreign Aid have Improved Secondary Canal's Gets ...	54
Table 4.11: The Extent that Foreign Aid have Improved Farms Routes	56
Table 4.12: The Extent that Foreign Aid have Improved Scheme Roads.....	58
Table 4.13: Trainings About Improved Agriculture	59
Table 4.14: The Key Focused Areas of the Trainings	61
Table 4.15: Agricultural Activities Improved Due to The Trainings Provided	63
Table 4.16: Number of Cultivations Per Season.....	64
Table 4.17:: Reasons for cultivating once per season	65
Table 4.18: Number of Bags (7tins) Produced before Project	67
Table 4.19: Agricultural Practices before the Project	68

Table 4.20: Number of Bags (7tins) Produced after the Project	71
Table 4.21: Paddy production and productivity for the past nine years (from 2014 to 2022)	73
Table 4.22: Paddy Production and Productivity before and after the Project	73
Table 4.23: The Project Support Areas	75
Table 4.24: Foreign Aids Contributions to Improvement of the Scheme's Management Systems.....	77

LIST OF FIGURES

Figure 3.1: The Location of Dakawa Irrigation Scheme	27
Figure 4.1: Bar graph of Respondents Age	39
Figure 4.2: The Old and the Newly Installed Submissible Pumps at Dakawa Paddy Farms.....	50
Figure 4.3: Dakawa Paddy Irrigation Scheme Main Canal.....	52
Figure 4.4: A Secondary Canal Gate filled with Mud at Dakawa Paddy Irrigation Scheme	53
Figure 4.5: One among the Feeder Roads Heading to Dakawa Paddy Farm.....	57
Figure 4.6: Entities that Facilitated Trainings at Dakawa Paddy Irrigation Scheme .	60
Figure 4.7: The Area (Acre) Cultivated before the Project.....	66
Figure 4.8: The Size of Land Cultivated After the Project	69
Figure 4.9: Paddy Production before and after the Project	72
Figure 4.10: The Achievements attained after Receiving Improved Farming Trainings	74

LIST OF ABBREVIATIONS AND ACRONYMS

DFID	Department for International Development
FAO	Food and Agriculture Organization
GDP	Growth Domestic Product
IO	Irrigator's Organization
IPCC	Intergovernmental Panel on Climate Change
NAFCO	National Agriculture and Food Corporation
SSA	Sub-Saharan Africa
UNDP	United Nation Development Programme
URT	The United Republic of Tanzania
USAID	United State Agency for International Development
UWAWAKUDA	The Dakawa Irrigator's Cooperative Union
WUA	Water User Association

CHAPTER ONE

INTRODUCTION

1.1 Background Information

The agricultural sector is a cornerstone of economic development in Sub-Saharan Africa (SSA), serving as a primary source of food, income, and employment, and contributing significantly to poverty reduction (Ssozi et al., 2017). In Tanzania, agriculture currently contributes approximately 24% of the Gross Domestic Product (GDP), a reduction from 30% a decade ago. This sector also contributes around 24% to exports, down from 45% over the same period (URT, 2016; Makoi and Matekere, 2018).

Despite its importance, agricultural productivity in SSA is often constrained by non-optimal water availability, leading to frequent food shortages (Reuben, 2014; Ssozi et al., 2017; Makoi and Matekere, 2018). These challenges are exacerbated by climate change and increasing competition for water resources from domestic, agricultural, and industrial demands, especially during dry seasons (IPCC, 2007; Lalika et al., 2011; Lalika et al., 2015). Smallholder farmers relying on rain-fed agriculture are particularly vulnerable due to their limited adaptive capacity (Bosongo, 2011; Balama et al., 2013).

Globally, foreign aid agencies have made significant investments in agriculture to alleviate poverty and hunger in developing countries. These investments often include farmer training programs, sustainable input use, diversified crop cultivation, and improved marketing and post-harvest practices (Blair et al., 2013). For instance, the World Bank has allocated over \$400 million toward agricultural training and

education over the past two decades. In Tanzania, foreign aid has been instrumental in the development of irrigation schemes, although the specific impact of such aid on the Dakawa Irrigation Scheme remains under-researched. This study addresses this gap by focusing on how foreign aid has contributed to the development and sustainability of the Dakawa scheme.

Irrigation has played a crucial role in boosting agricultural productivity and global food security. From 1961 to 2009, the global irrigated area increased by 117%, with irrigated land now producing over 40% of the world's agricultural output on less than 20% of arable land. Despite its benefits, irrigation has raised concerns about environmental degradation, including inefficient water use, soil salinization, groundwater depletion, and water pollution (FAO, 2018). With the global population expected to exceed 9 billion by 2050, food production must increase by 70% worldwide and 100% in developing countries, largely through yield improvements and intensified cropping on existing farmland. By 2050, the global irrigated area must expand by 6%, with a 17% increase in cropping intensity (FAO, 2018). In response, Tanzania and other SSA countries, such as Zimbabwe, have embraced irrigated agriculture as a strategy to enhance food security and economic growth (Oates et al., 2017; Makoi and Matekere, 2018). Irrigation is also seen as a buffer against climate variability, enhancing crop stability, reducing food insecurity, and promoting cash crop exports (Bosongo, 2011; Oates et al., 2017; Makoi and Matekere, 2018).

However, the development and maintenance of irrigation infrastructure require substantial financial resources, advanced technical skills, and complex institutional

frameworks (Sidibé et al., 2016). Given the economic limitations of many African nations, including Tanzania, self-financing these needs is challenging (Reuben, 2014; Oates et al., 2017). As a result, many countries rely on foreign aid to support agricultural initiatives, including irrigation. The Dakawa Irrigation Scheme in Morogoro, Tanzania, exemplifies a project that depends on external funding due to limited government resources (Mdee et al., 2014). Initially built by the Tanzanian government in 1982, the scheme has suffered from declining productivity and deteriorating infrastructure due to poor management and a lack of consistent maintenance (Mdee et al., 2014; Makoi and Matekere, 2018). Intervention through foreign aid was crucial in reviving the scheme's infrastructure, though local farmers still contribute through annual fees to cover operational costs (Mdee et al., 2014).

Despite these benefits, foreign aid in irrigation development is not without its limitations. Over-reliance on aid may foster dependency, potentially undermining local self-sufficiency and initiative. Additionally, foreign-funded irrigation projects can have environmental downsides, such as exacerbating water scarcity through overuse and increasing soil salinity in certain contexts (FAO, 2018). In Tanzania, limited water resources and competing demands for water pose additional challenges to irrigation schemes, especially in regions that depend heavily on river systems like the Wami River, which supplies the Dakawa scheme. There is a critical need to evaluate the environmental sustainability of such schemes and to balance foreign assistance with strategies that promote long-term self-reliance and resource efficiency. This study examines the contribution of foreign aid to the Dakawa Irrigation Scheme, aiming to provide insights into the aid's impact on infrastructure,

management, and farmer capacity. The findings will inform policy makers on the potential benefits and risks associated with foreign aid in agriculture and support the development of frameworks that ensure sustainability and resilience in foreign-funded irrigation projects.

1.2 Research Problem Statement

Irrigated agriculture contributes approximately 40% of global food production from just 18% of the world's cultivated land, underscoring its critical role in addressing food security (World Bank, 2003). Globally, an estimated 143.3 million hectares are under irrigation, while Africa's irrigated land is significantly lower, at approximately 12.2 million hectares (You et al., 2010; Hussain and Hanjira, 2004). In Tanzania, about 29.4 million hectares have potential for irrigation; however, only a small fraction (1.6%) has benefited from improved irrigation infrastructure, contributing 24% of the nation's food requirements (URT, 2016a; Makoi and Matekere, 2018). This gap in infrastructure underlines the challenges that smallholder farmers face in achieving adequate water supply for consistent agricultural productivity.

Recognizing these challenges, international donors—including DFID, USAID, UNDP, FAO, and the Norwegian Embassy—have partnered with the Tanzanian government to promote agricultural development and irrigation schemes (Martin-Prével et al., 2016). Foreign aid efforts aim to alleviate critical constraints for small-scale farmers, enabling them to boost productivity and improve livelihoods (Gebrekidan et al., 2020). The Dakawa Irrigation Scheme, located in Morogoro, is one of Tanzania's largest recipients of foreign aid for agriculture, benefiting from

initiatives such as USAID's NAFKA project, which provides essential inputs and support to maximize productivity (Mdee et al., 2014; CDM, 2014).

While studies have explored the general impact of foreign aid on agricultural growth in Sub-Saharan Africa, particularly on productivity and GDP (Reuben, 2014; Ssozi et al., 2017), there remains a critical gap in understanding the specific contributions of foreign aid to infrastructure improvement and management systems within the Dakawa Irrigation Scheme. The scheme faces ongoing challenges, such as limited water availability from the Wami River, highlighting the need for efficient water-use infrastructure and sustainable management practices (Mdee et al., 2014). The absence of targeted research on foreign aid's role in enhancing these elements at Dakawa presents a missed opportunity to identify best practices and areas for improvement that could inform similar initiatives across Tanzania and other developing regions.

This study aims to address this gap by providing an in-depth assessment of the impact of foreign aid on the Dakawa Irrigation Scheme's infrastructure, management systems, and farmer capacity. Understanding the specific effects of foreign aid in this context is essential not only for enhancing local agricultural productivity but also for achieving broader economic and developmental goals, such as poverty reduction, job creation, and the sustainable growth of rural communities. The findings are expected to offer valuable insights for policymakers, donors, and other stakeholders, enabling more strategic allocation of foreign aid resources in the agriculture sector. Additionally, this research could serve as a foundation for future studies on foreign

aid's role in sustainable agricultural development, particularly in regions that face similar challenges to Tanzania's Dakawa scheme.

By contributing to an evidence-based understanding of foreign aid in irrigation and agricultural development, this study has the potential to support more effective policy design, institutional frameworks, and resource management in Tanzania's agriculture sector. The implications extend to supporting district council revenues, improving individual incomes and living standards, creating employment opportunities—especially for youth—and promoting economic growth in the Dakawa township and similar rural areas.

1.3 Research Objectives

1.3.1 Main Objective

To investigate the contribution of foreign aid on development of Dakawa Irrigation Scheme in Morogoro, Tanzania.

1.3.2 Specific Objectives

- i. To assess the contribution of foreign aid in irrigation infrastructure development
- ii. To assess the contribution of foreign aid at Dakawa Irrigation scheme on farmers' capacitation.
- iii. To examine the role of foreign aid in strengthening schemes management system.

1.4 Research Questions

- i. To what extent foreign aid improved irrigation infrastructures at Dakawa irrigation scheme?
- ii. To what extent has foreign aid at Dakawa Irrigation Scheme facilitated farmers' capacity building and satisfaction?
- iii. How has foreign aid helped in improving management units of Dakawa Irrigation scheme?

1.5 Justification of the Problem

IPCC (2007) reported that impacts of climate change on water availability are expected to aggravate. This is a call for investment for new infrastructures that increase water use efficiency. The government alone cannot provide all of the required resources (financial, technical, and managerial resources); assistance from developed countries is inevitable (URT, 2016b). Hence it is crucial to assess the contribution of foreign aid on agriculture growth, particularly irrigation scheme infrastructure related to water use and management system. This will help policy makers to formulate policies that attract more investment. This study will also serve as a framework and guidelines to other stakeholders who are entrusted with the agricultural development in the country. More important, the result of this study is useful for improving policy design, institutional set up, implementation, monitoring and evaluation in the area of foreign aid allocation to agriculture sector in general and project/program wise in particular for the sake of agricultural development in Tanzania. Finally, the study may encourage more research to be conducted on this topic in other foreign agricultural funded regions of Tanzania on a large- scale that

will involve all stakeholders including academicians, researchers, students and policy makers.

1.6 Significance of the Study

As climate change intensifies, water availability is expected to become increasingly constrained, posing significant challenges to agricultural productivity and food security (IPCC, 2007). This growing scarcity calls for substantial investments in infrastructure to improve water-use efficiency in agriculture. Given the financial, technical, and managerial limitations faced by the Tanzanian government, foreign aid from developed countries has become an essential resource to address these needs (URT, 2016b). Assessing the role of foreign aid in supporting agricultural growth, specifically through irrigation infrastructure and water management systems, is thus a critical area of inquiry.

This study is expected to contribute valuable insights for policymakers, particularly in the formulation of irrigation policies that prioritize efficient water use and sustainable management practices. As the demand for irrigation infrastructure in Tanzania's agricultural sector continues to rise, this research will provide practical information for the design and implementation of effective irrigation schemes. The findings will support the development of policies that can enhance the productivity and resilience of agriculture in the face of climate variability and increasing water demands.

Moreover, the study has practical significance for a variety of stakeholders, including farmers of the Dakawa Irrigators Cooperative Union, Dakawa Irrigation Scheme board members, government officials, and the local community. By identifying the

specific ways in which foreign aid has supported the Dakawa scheme, this research will offer guidance on overcoming barriers that could impede the scheme's development and expansion. The insights gained could assist these stakeholders in enhancing project sustainability, improving water resource management, and fostering community engagement.

In a broader academic context, this study will contribute to the existing body of knowledge on the role of foreign aid in the development of irrigation schemes in Sub-Saharan Africa. By focusing on the Dakawa Irrigation Scheme, the research will provide a case study that can inform similar initiatives in other regions facing comparable challenges. The findings are expected to highlight best practices and potential areas for improvement, ultimately supporting the goal of sustainable agricultural development in Tanzania and beyond.

CHAPTER TWO

LITERATURE REVIEW

2.1 Chapter Overview

This section contains review of theories and review of empirical studies. The review of related literature is organized and presented according to major themes as drawn from research objectives. The chapter will end with summary of empirical studies and demonstration of knowledge gap.

2.2 Conceptual Definitions

2.2.1 A donor

Is an individual, a group of people or an organisation that provides assistance aiming at generating economic growth and reducing poverty through finance investments and interventions in a community (Shirlanne, 2013). In this study, the term donor refers to financial institutions which were responsible in funding the development of Dakawa Irrigation Scheme at Mvomero District Council in Morogoro.

2.2.2 Foreign Aid

Foreign aid refers to a form of assistance provided by donors and received by recipient country for development. It simply means the type of aid given to agricultural sector of projects (Encyclopedia, 2013). Foreign assistances are attracted in Africa to improve economic performance. Tanzania as other African countries has made tremendous efforts to attract more foreign agricultural aid through institutional and legal frameworks (Ajayi 2006).

2.2.3 Development of Irrigation Scheme

The development of irrigation scheme involves the formulation stage, implementation stage, training, operations and maintenance. The process of developing irrigation schemes starts after the Obstacles and Opportunities of Development (O and OD) exercise. According to the District Agricultural Development Plans, guidelines on Irrigation Scheme Development (2009), the process of developing Irrigation scheme involves the following four main stages;

2.2.3.1 Formulation Stage

Confirmation of irrigation development priority of the district, Quick site inspection for all irrigation schemes, Screening of all Irrigation schemes, Assessment and Endorsement by Zonal Irrigation and Technical Services Unit (ZITSU), Field Survey for selected Irrigation schemes, Preliminary planning for selected Irrigation schemes, Identification of District Supporting program, Design of District Supporting program, Preparation of irrigation Scheme formulation plan report, Validation and Agreement by ZITSU, Feedback workshop for selected irrigation schemes, Finalize Irrigation scheme formulation plan for DADP.

2.2.3.2 Implementation Stage

Scheme awareness campaign, participatory action plan, participatory diagnostic study, letter of understanding, participatory design/feasibility study, Joint Investment Decision/financing agreement, Detailed design/Tender document, Tendering/contract award, Implementation.

2.2.3.3 Operation and Maintenance Stage

Establishment of Operation and Maintenance (O and M) System, Planning of Operations and Management, Practice of Operations and Management, recording and reporting, Monitoring of Operations and Management

2.2.3.4 Training Stage

Preparation of Training Manuals by Zonal Irrigation Training System Unit, Training of District Irrigation Development Team (DIDT) by ZITSU, Training of Irrigators Organization (IO) members/farmers by District Irrigation Development Team.

2.3 Theoretical Literature Review

This study is primarily guided by Open Systems Theory, originally developed by Ludwig von Bertalanffy (1951). Open Systems Theory posits that organizations are inherently influenced by their environment, which includes various external forces of economic, political, and social nature. This environment provides essential resources, which organizations need to adapt, grow, and survive. As applied in this study, the theory suggests that the Dakawa Irrigation Scheme is an open system that depends on external resources, such as foreign aid, to enhance its infrastructure and operational capacity. External funding plays a crucial role in the irrigation scheme's ability to adapt to environmental challenges, particularly those related to climate change and resource scarcity. Open Systems Theory was developed post-World War II in response to more rigid, closed-system perspectives of organizations, emphasizing instead that organizations must interact dynamically with their environment (Bastedo, 2004). The theory outlines how components within an organization, or a system, operate interdependently, structured in hierarchical orderings. Lai and Lin

(2017) highlight that these components function collaboratively, where no single component can operate independently of the others. In tightly coupled systems, interdependence is particularly strong, while loosely coupled systems may have subsets of tightly connected components. For the Dakawa Irrigation Scheme, interdependence is evident among various stakeholders, including foreign donors, government agencies, and local farmers. The permeability of boundaries within this open system enables resource exchange, which supports the scheme's ongoing development. Resources received (inputs) are transformed into outputs, such as agricultural productivity, through coordinated internal processes, embodying the throughput system. Feedback mechanisms, both positive and negative, further enable the system to adjust to environmental changes, aligning with the continuous need for adaptation within dynamic agricultural settings. These mechanisms ensure that the irrigation scheme not only remains functional but also resilient to external pressures, thereby demonstrating the concept of holism—where the system's totality surpasses the sum of its parts.

In addition to Open Systems Theory, Modernization Theory provides an important perspective on the role of foreign aid in promoting socio-economic development within agricultural systems. This theory posits that foreign aid from developed nations can catalyze the "modernization" of infrastructure, agricultural practices, and management in developing regions, facilitating a transition toward higher productivity and economic advancement (Jain, 2023; Roshan, 2015). In the context of the Dakawa Irrigation Scheme, foreign aid has facilitated the adoption of modern technologies and agricultural techniques, enhancing local capacity and productivity.

However, Modernization Theory has been critiqued for potentially fostering dependency on foreign resources, as it may not fully accommodate local socio-economic conditions. Opara (2018) found that, in Nigeria, foreign aid improved agricultural productivity but also presented challenges related to autonomy and resource sustainability. For the Dakawa scheme, while foreign aid has enhanced productivity, the theory encourages an assessment of how these benefits can be sustained locally over time.

Dependency Theory offers a contrasting perspective, arguing that foreign aid may create a dependency cycle where recipient countries become reliant on continuous external support, potentially undermining their self-sufficiency. According to this theory, aid from wealthier nations to developing countries often reinforces structural inequalities, wherein resources flow from poorer nations back to wealthier ones, perpetuating dependency (Sunday et al., 2019; Chirinos, 2017). For irrigation schemes such as Dakawa, Dependency Theory emphasizes the risks associated with over-reliance on foreign aid, as demonstrated in the findings of Ahmed and Golole (2023), who observed that food aid in Somalia led to reduced local agricultural productivity and an increased dependency on external support. This theory suggests that while foreign aid has been crucial for Dakawa, it is essential to develop local resourcefulness and sustainability strategies to avoid long-term dependency.

Finally, Institutional Theory provides a critical framework by examining how the quality and structure of local institutions impact the effectiveness and sustainability of foreign aid. This theory posits that robust institutional framework characterized by governance transparency, accountability, and effective policy implementation are

necessary for maximizing aid effectiveness (Wambaka & Mutenyo, 2022). Within the Dakawa Irrigation Scheme, strong institutional structures can enhance project management and resource allocation, ensuring that foreign aid contributes to sustainable agricultural development. Tadesse et al. (2019) highlight that effective institutions reduce transaction costs and increase community engagement, which are vital for the scheme's longevity. Additionally, this theory underscores the importance of aligning donor objectives with local institutional capacity, as demonstrated by Dash et al. (2023), who argue that high-quality institutions enable recipient communities to better integrate aid with local priorities.

By combining Open Systems, Modernization, Dependency, and Institutional theories, this study adopts a multifaceted approach to explore the impact of foreign aid on the Dakawa Irrigation Scheme. Each theory provides unique insights into the dynamics of aid, development, and sustainability within the context of agricultural systems, emphasizing the balance needed between external support and local resilience.

2.3.1 Historical Background UWAWAKUDA

UWAWAKUDA was registered on 24th July, 2006 with a registration number of MGR 367. The organization was started with 375 members. Currently is made up of 941 members of which 550 are male and 384 are female. The UWAWAKUDA was initiated from the Government farm which was established under the National Agricultural and Food Cooperation in 1982. The NAFCO failed to run the farm and in 2003 the Government under Parastatal Sector Reform Commission (PSRC), program was decided to privatizing the farm and allow the small-scale farmers from

Mvomero District Council (Dakawa village) and Morogoro Municipal to take over the farm. However, before taking over the farms, farmers were required to clear the outstanding debt of around Tshs 267,000,000 left by EX NAFCO. It was also decided that the Paddy processing plant and warehouse formerly owned by NAFCO would have been also privatized. The UWAWAKUDA has a total area of 3,225.15ha of land of which 2,000ha have improved irrigation infrastructures (irrigated area), 1,900 hectare are used by UWAWAKUDA while 100Ha are used by TARI Dakawa for research purposes. The area of 1000ha not developed and the rest 225.15 are special for premises and forestry reserve. The UWAWAKUDA has an offer of land occupancy of 66 year and got it 18th April,2012 (UWAWAKUDA Report, 2022).

2.3.2 Paddy Production Before the Project

Before the project, the production and productivity of paddy was very low. It was estimated to be 1.5 to 2tons per hectare. The low yield was contributed by the following factors; the use of low-quality seeds, poor sowing methods (broadcasting), low application of fertilizers, high infestation of weeds such as wild paddy, poor irrigation infrastructures and most of the land for irrigation was not well developed. In order to improve paddy production and productivity UWAWAKUDA initiated a program of training to trainers in order to share knowledge and skills on good agronomic practices for paddy producers in the scheme. During the implementation of the program, every year 50 farmers were trained and each farmer was required to train his/her fellow farmer to ensure that every farmer in the scheme is knowledgeable enough in paddy production.

Table 2.1: Paddy Production and Productivity for the Past Nine Years (from 2014 to 2022)

Year	2014	2015	2016	2017	2018	2019	2020	2021	2022
Ton/ha	4	5.6	6.8	6.5	6.5	7.2	5.4	6.3	6.0
Tons	7600	10,640	12,920	12,350	13,350	13,650	10,260	11,970	11,400

Source: UWAWAKUDA Report, (2022)

2.3 Empirical Literature Review

2.3.1 Irrigation Infrastructure Funded by Foreign Aid

Several studies have examined the role of foreign aid in supporting irrigation infrastructure, with findings highlighting both the successes and challenges associated with these interventions. Wang and Wu (2018) conducted a study in rural China to assess the role of Water User Associations (WUAs) in irrigation management. Using data from 15,566 households across 941 villages, the study found that WUAs did not demonstrate overall superiority in managing irrigation compared to traditional institutions. This outcome was largely attributed to China's centralized political environment, which limited the autonomy and effectiveness of WUAs. The study employed an institutional analysis and development framework, identifying diverse factors that influenced irrigation management performance, with WUAs playing a relatively minor role.

Yohannes et al. (2017) conducted a similar study in the Gumselassa irrigation scheme in Northern Ethiopia. Their survey of 109 farmers, grouped by water source, along with focus group discussions and field measurements, revealed that poor

irrigation practices and severe water scarcity contributed to reduced crop yields and soil salinization. Despite farmers' adaptation efforts, including a reduction in irrigated land enforced by local authorities, crop yields continued to decline, indicating persistent challenges in managing water resources effectively.

Turning to the East African context, significant challenges remain in terms of the financial and structural capacity to support extensive irrigation infrastructure. Palazzo et al. (2019) estimated that constructing new irrigation infrastructure requires approximately \$16 billion annually, with additional costs for depreciation, upgrading, and efficiency improvements. In contrast, developed countries are better positioned to handle these investments, while many African nations, including Tanzania, face financial constraints (Reuben, 2014; Palazzo et al., 2019). For instance, Tanzania's expenditure on irrigation development was only 21.1% of the approved budget on average, dropping from 46.7% in 2012/13 to 9.4% in 2016/17, illustrating the critical funding gap that necessitates foreign aid (Makoi & Matekere, 2018).

In Tanzania, foreign aid has played a crucial role in supporting irrigation schemes and enhancing water management practices. For example, a study by Materu et al. (2018) demonstrated that alternative irrigation management practices could significantly increase water use efficiency and rice productivity. Their research on rice production under the System of Rice Intensification (SRI) found that SRI methods could save up to 35% of water compared to conventional practices, with a notable increase in rice yield. This approach could support Tanzania's agricultural sector in meeting food security goals while optimizing water resources.

Furthermore, research on the Mkindo Irrigation Scheme in Tanzania by Mboyerwa et al. (2022) investigated the impact of nitrogen use efficiency under both SRI and conventional management practices. The study showed that SRI, combined with optimal nitrogen levels, significantly improved rice growth and yield, emphasizing the importance of both infrastructural and technical support in maximizing foreign aid's effectiveness. Similarly, Khatib et al. (2019) explored water allocation among farmers in the Kiladeda sub-catchment of Tanzania, identifying inequities and high unmet water demand due to excessive water abstraction. These findings underscore the need for collaborative water management approaches and legal frameworks to ensure fair distribution and sustainable use of water resources.

These studies indicate that while foreign aid has facilitated infrastructure development and water management improvements in Tanzania, the success of such initiatives is closely linked to local institutional frameworks, resource allocation, and the adoption of efficient agricultural practices. By examining these empirical findings from Tanzania and the broader East African region, this review highlights the importance of tailored approaches that address specific regional needs and challenges for sustainable irrigation management.

2.3.2 Role of Foreign Aid at the Management System of Irrigation Scheme

The management systems within irrigation schemes can be significantly influenced by foreign aid, impacting both productivity and sustainability. Nadia (2016) examined agricultural aid's role across various productivity levels in low- and lower-middle-income countries from 2002 to 2014, finding a positive relationship between agricultural aid and productivity. Her study highlighted that, to double agricultural

productivity by 2030, donor agencies would need to increase agricultural aid by 126% above the current levels, indicating the potential magnitude of impact that sustained aid can have. However, her findings also revealed that policy effectiveness indicators were negatively associated with productivity, though insignificantly, suggesting that without robust governance frameworks, the impact of foreign aid might be limited.

Complementing this perspective, Islam (2011) argued that many international donors are hesitant to fund large-scale irrigation projects, such as those involving reservoirs and dams, as they may not align well with the needs of poor farmers and often face challenges related to sustainability. This limitation on project types underscores the complexities surrounding foreign aid allocation for irrigation systems, especially where there is ambiguity over whether funds are used for capital investments or operational costs, both crucial for long-term viability.

In the Tanzanian context, foreign aid has played a transformative role in irrigation management, as shown in studies conducted in East African irrigation schemes. Silayo and Pikirayi (2023) documented how community-based approaches to constructing and managing water infrastructure among the Chagga people on Mt. Kilimanjaro have fostered resilience and sustainability within irrigation systems. By involving local communities in infrastructure development and post-construction management, these approaches have led to sustainable water management practices that reflect socio-political and economic organization embedded within local traditions, enhancing the longevity of aid-funded projects. Additionally, a study by Khatib et al. (2019) in the Kiladeda sub-catchment in Tanzania illustrated the

significance of equitable water allocation among farmers, an area that often requires improved management practices under foreign-aided schemes. Their findings suggested that irrigation water management in regions with limited resources could be optimized through collaborative water management approaches and a review of regulations governing water distribution, which would ensure that aid funds address local challenges effectively and equitably.

These East African studies provide relevant insights into the impact of foreign aid on irrigation scheme management, highlighting both the potential and limitations of external support. They underscore the importance of integrating local management practices, enhancing governance frameworks, and aligning donor objectives with local needs to foster sustainable development in irrigation systems.

2.3.3 Role of Foreign Aid on Farmer Capacitation

Foreign aid plays a significant role in enhancing farmer capacity by supporting institutional development and skill-building initiatives. In Sri Lanka, Thiruchelvan (2010) conducted a study on farmer organizations (FOs) in the Anuradhapura and Kurunegala districts, examining their capacity to support sustainable irrigation. Using a stratified sample of 48 FOs from various irrigation systems, Thiruchelvan developed the Group Dynamics Effectiveness Index (GDEI) to evaluate FO effectiveness. The study revealed that larger, economically homogeneous FOs with active participation achieved better irrigation management. However, low accountability and transparency within FOs were identified as significant barriers to broader farmer engagement, particularly in major and medium irrigation systems. In Ghana, Adom and Boateng (2019) examined foreign aid's role in supporting

livelihoods among rural pineapple farmers. Their qualitative analysis showed that economic and political pressures often compromised land security for farmers, forcing them to seek alternative livelihoods even when aid was present. This study introduced "livelihood transience" as a concept to better capture the shifting livelihood strategies of farmers facing external threats to their primary assets.

In Tanzania, studies highlight similar dynamics, with foreign aid often channeled through local cooperatives to enhance productivity and farmer income. Rwela (2023) assessed the impact of Agricultural Marketing Co-operative Societies (AMCOS) on farmer livelihoods in Mvomero and Kilombero Districts. The study found that AMCOS improved access to agricultural inputs and credit, which were crucial for sustaining productivity. However, the study also highlighted limitations, such as inadequate managerial skills and interference by district officers, which affected cooperative autonomy and reduced the efficiency of aid distribution.

Msangya (2019) explored barriers to the effectiveness of USAID agricultural aid in Mvomero District, revealing that short funding cycles and poorly implemented agricultural policies hindered aid impact. Issues such as high fertilizer prices reduced the ability of farmers to benefit fully from training on agricultural inputs. This study underscores the importance of policy alignment and market support to ensure that foreign aid initiatives meet their intended goals.

The findings of these studies suggest that while foreign aid significantly enhances the capacity of farmers and cooperatives, its success depends on supportive institutional frameworks, policy coherence, and active stakeholder participation. Addressing these

factors can help ensure that aid contributes to sustainable agricultural development in East Africa.

2.4 Knowledge Gap

Despite significant research on the impact of foreign aid in agriculture, limited studies focus specifically on the role of foreign aid in irrigation schemes, particularly in East Africa. Existing literature, such as Reuben (2014), has highlighted positive impacts of agricultural foreign aid on productivity and GDP at a macroeconomic level. Ssozi et al. (2017) further demonstrated similar results, using econometric models to examine how agricultural foreign aid influences productivity. However, these studies generally provide broad analyses without delving into specific contributions to irrigation infrastructure or the management of irrigation schemes.

Specific aspects of foreign aid's impact on irrigation schemes remain under-researched. For instance, there is limited empirical evidence examining how foreign aid affects the operational efficiency, long-term sustainability, and local governance structures of irrigation projects in Tanzania. Studies such as those by Boafo-Arthur (2014) on Ghana's Weija Irrigation Project and Mwazambumba (2015) on the Njolo irrigation scheme in Malawi suggest that aid can significantly influence local management practices and infrastructure sustainability and **No table of figures entries found.** to which these findings are applicable to Tanzanian contexts, like the Dakawa Irrigation Scheme, is not well-documented. This study aims to address this gap by investigating foreign aid's specific contributions to infrastructure improvement, management practices, and farmer capacitation within Tanzanian irrigation schemes, with a focus on Dakawa.

2.5 Conceptual Framework

The conceptual framework for this study provides a structured lens for analyzing the role of foreign aid in the development of the Dakawa Irrigation Scheme. It establishes clear relationships between the variables and demonstrates how external support translates into tangible developmental outcomes.

At the core of the framework is the independent variable, foreign aid, which serves as the fundamental input driving the interventions within the irrigation scheme. Foreign aid provides financial resources, technical expertise, and other forms of support that enable the implementation of targeted initiatives aimed at enhancing the scheme's performance and sustainability. The intervention variables capture the specific areas where foreign aid exerts its influence, organized around three critical dimensions. The provision of irrigation infrastructure encompasses efforts to improve intake structures, pump stations, primary and secondary canals, main gates, and scheme routes and roads. These infrastructure upgrades are designed to enhance water delivery, reduce inefficiencies, and ensure the resilience of the irrigation system. Farmer capacitation represents another essential dimension, focusing on empowering farmers through training programs that impart modern agricultural practices, facilitating access to vital agricultural inputs like seeds and fertilizers, and improving access to finance to support investments in farm productivity. Finally, the management system plays a pivotal role, emphasizing the maintenance and rehabilitation of infrastructure, ensuring equitable allocation of water and land rights, and managing the efficient utilization of foreign aid to sustain the scheme's operations and governance structures.

The dependent variable is the development of the Dakawa Irrigation Scheme, which is measured through outcomes such as improved agricultural productivity, increased household income, job creation, and enhanced social services. These outcomes reflect the effectiveness of foreign aid in addressing both the immediate and long-term needs of the scheme and its stakeholders.

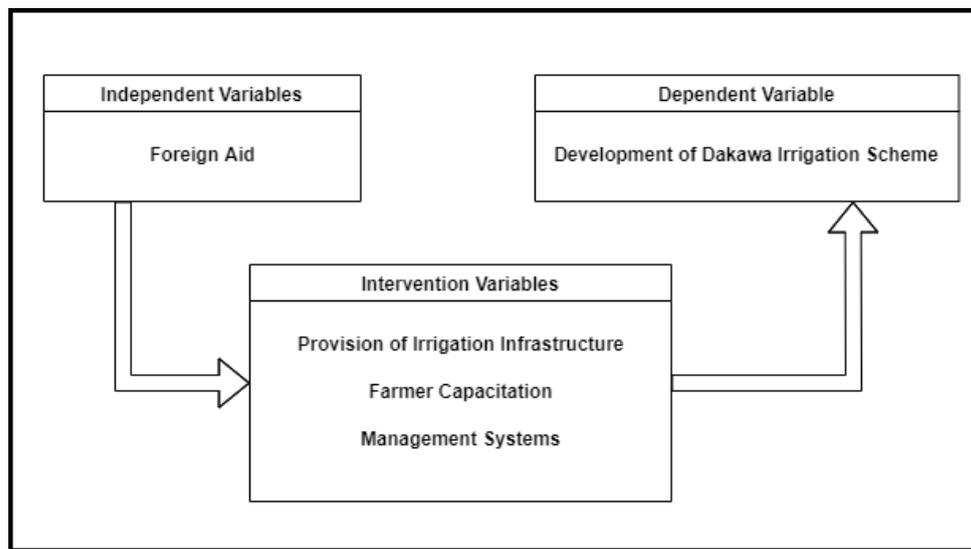


Table 2.2: Conceptual Framework

This conceptual framework, visually represented in the diagram, demonstrates the logical flow from foreign aid as an input to the interventions it enables and, ultimately, to the developmental outcomes it seeks to achieve. By breaking down the variables into measurable components, the framework fosters a data-driven approach, ensuring that the analysis remains focused on tangible impacts. It provides a comprehensive structure for assessing how foreign aid contributes to the infrastructure, farmer empowerment, and institutional strengthening necessary for the sustainable development of the Dakawa Irrigation Scheme.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Chapter Overview

This chapter describes how the proposed study was conducted. It presents the research approach, research design, area of the study, targeted population, sampling techniques, procedure and sample size, data collection instruments, validity and reliability, data analysis, and ethical considerations.

3.2 Research Approach

The study was guided by mixed research approach. The researcher used mixed research approach because it involved collecting both quantitative and qualitative data, integrating the two forms of data, and using distinct designs that involved philosophical assumptions and theoretical frameworks. Using multiple methods, researcher was able to gather and analyze considerably more and different kinds of data than they would be able to use just one approach (Creswell & Plano, 2018).

3.3 Research Design

The study adopted convergent research design under mixed research approach. In this case both qualitative and quantitative data were collected, merge the data and use the results to address research problem. It is useful especially when a researcher has limited time to collecting data in the field and must gather both types of data in one visit. The researcher needs both quantitative and qualitative forms of information from every participant (Creswell & Plano Clark, 2018; Creswell & Creswell, 2018).

3.4 Study Area

The study was conducted at Dakawa Irrigation Scheme found in northern part of Mvomero District in Tanzania (Figure 1) (CDM, 2014). It is located at latitude 6024' S, longitude 37033'E and it's about 45 km from Morogoro town (CDM, 2014; Mdee et al., 2014; Mbaga et al., 2017). It is the site of one of the largest irrigated paddy schemes in Tanzania, with 2000 ha of paddy (Mdee et al., 2014; Oates et al., 2017; Mbaga et al., 2017). It was originally constructed in 1982 by the Tanzanian government, through the National Agriculture and Food Corporation (NAFCO).

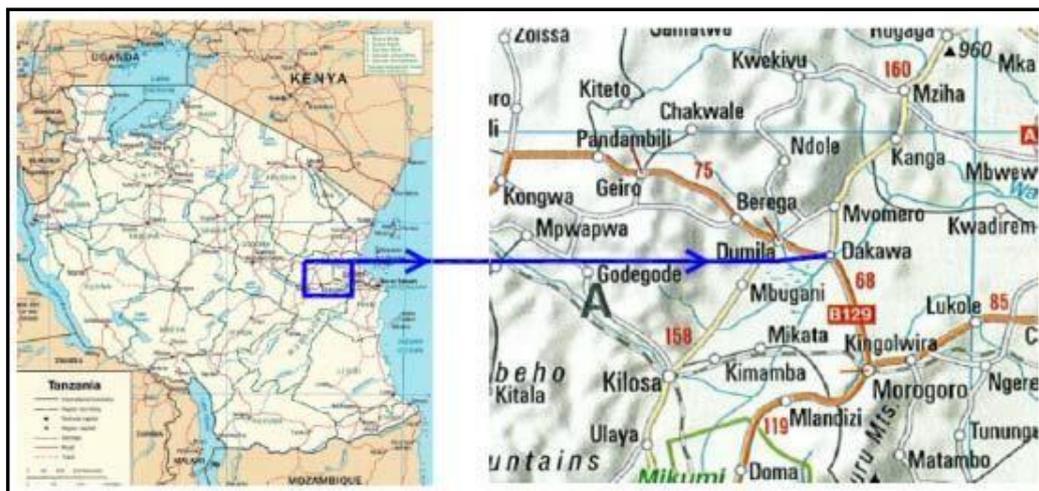


Figure 3.1: The Location of Dakawa Irrigation Scheme

Source: CDM, (2014)

Today, the scheme is run by the Dakawa Irrigators Cooperative Union (UWAWAKUDA), an association of over 941 farmers (China-DAC Study Group, 2012; CDM, 2014). Land within the paddy farm is accessed by membership of the water users' association (UWAWAKUDA). Dakawa Irrigation Scheme is selected because is among the largest recipient of foreign aid in Tanzania (Oates et al., 2017).

The international donors operating at the scheme include United States, Korea, China and Japan International Cooperation Agency. Dakawa Irrigation Scheme also face inadequate water supply from Wami River (Mdee et al., 2014).

3.5 Target Population

The target population of this study involved 960 Dakawa Irrigators Cooperative Union of Dakawa irrigation scheme, 05 board members, peasants and board members were involved in the study because they are the key implementers of the project. They provided experience regarding contribution of foreign aid on development of Dakawa irrigation scheme. Similarly, the study targeted 01 Director of Dakawa irrigation scheme. The director of Dakawa irrigation scheme involved because is one oversee of all activities at Dakawa irrigation scheme.

3.6 Sampling Design and Sample Size

In this study simple random sampling method was used so as to give equal chances of the respondents to be included in the sample (Kothari, 2010). Four sub villages in Dakawa Irrigation scheme namely, Dihombo (23) Nderekesi (24) Mtakuja (20) and Kwapazi (18) were selected with their respective representatives. The representatives were selected from each sub village out of which 43 were male and the rest 42 were women to make a total of 85 respondents.

3.6.1 Sample Size

The sample size was obtained by using (Yamane formula of 1967) formula which is represented as follows;

$$n = \frac{N}{1 + Ne^2}$$

Whereby;

n = Sample size

N = Representative of Dakawa irrigation scheme = 85

e = Error (level of significance) = 5%

$n = 85 / 1 + 85 [0.05]^2$

n = 70 respondents.

3.6.2 Sampling Procedures

The researcher employed both probability and non-probability sampling techniques. In probability sampling, the researcher selected individuals from the population who were representative of that population. In non-probability sampling, the researcher selected individuals because they were available and represent some characteristic the investigator seeks to study (Creswell, 2012).

3.6.2.1 Sampling of Dakawa Irrigators Cooperative Union

The researcher used stratified and simple random techniques to select Dakawa Irrigators Cooperative Union (male and female) representatives who involved in the study. The exercise of getting the sample done through sampling with replacement. The stratified sampling techniques was employed because of heterogeneous nature of

respondents. In stratified sampling technique population were divided into layers or strata whereby in simple random technique in which every element in the study population has an equal chance of being selected (Leavy, 2017). The issues of gender were taken into consideration by the researcher. The Dakawa Irrigators Cooperative Union were taken care of because they are the main implementers of Dakawa irrigation scheme project. Hence, were considered to be source of first-hand information in issues relating to contribution of foreign aid on development of the scheme. For this study 70 representatives from Dakawa irrigation scheme were involved.

3.6.2.2 Sampling Dakawa Irrigation Scheme Board Members

Dakawa irrigation scheme board members were purposively selected in the study by virtue of their position. Purposeful sampling technique (also called purposive or judgment sampling). Is based on the premise that seeking out the best cases for the study produces the best data, and research results are a direct result of the cases sampled (Leavy, 2017).

3.6.2.3 Sampling Director of Dakawa Irrigation Scheme

The director of Dakawa irrigation scheme was purposively selected in the study by virtue of their position. Purposeful sampling technique (also called purposive or judgment sampling).

3.7 Data Collection Instruments

Data collection instruments were the tools used by the researcher to collect data to answer the research objectives. The study was essentially used a combination of both qualitative and quantitative data collection instruments such as questionnaires for

farmers of Dakawa Irrigators Cooperative Union and interview for Dakawa irrigation scheme board members.

3.7.1 The Farmers Questionnaires for Dakawa Irrigators Cooperative Union

The study used opened ended and closed ended questions in collecting data from the Dakawa Irrigators Cooperative Union. The essence of using this technique it allows coverage of a large target population within a short period of time and with low financial cost.

3.7.2 Interview for Dakawa Irrigation Scheme Board Members

To gain a comprehensive understanding of the management and technical challenges at the Dakawa Irrigation Scheme, structured interviews were conducted with five board members who hold direct responsibilities within the scheme's operations. These interviews were guided by a set of carefully constructed questions designed to elicit primary data on key aspects, including the performance of scheme management, farmer capacity-building initiatives, technical maintenance processes, and the functionality of critical irrigation infrastructure components (such as storage facilities, water pumps, canals, canal gates, and drainage systems).

While interviews with board members provided valuable insights into high-level perspectives, additional data collection methods were employed to capture the diverse experiences and challenges faced by other stakeholders. Focus group discussions were organized with farmers and technical staff to gather a wider range of viewpoints on day-to-day operational challenges, infrastructure issues, and support needs. These group discussions allowed for an exchange of ideas among participants,

highlighting collective and contrasting perspectives that contributed to a more nuanced understanding of scheme operations.

In addition, direct observation was conducted to complement interview findings and provide contextual information on the technical and structural conditions of the irrigation infrastructure. Observations focused on the physical state and functionality of storage facilities, water pumps, and canal systems, as well as on the practical aspects of scheme maintenance and irrigation practices. This method enabled the researcher to validate interview responses and observe operational realities firsthand.

By incorporating these diverse data collection methods, this approach ensured that the study captured a well-rounded and detailed picture of the Dakawa Irrigation Scheme's management dynamics and technical complexities. This multi-method approach strengthens the study's findings and provides a more robust foundation for understanding the overall impact of foreign aid on the scheme.

3.8 Validity and Reliability of Research Instruments

This section presents the validity and reliability of research instruments.

3.8.1 Validity of Research Instruments

Validity refers to the degree to which a research instrument accurately measures what it is intended to measure, thereby ensuring the credibility of research findings and conclusions. In this study, both qualitative and quantitative validity measures were employed to enhance the reliability of the results. For qualitative validity, the researcher used triangulation and peer debriefing. Triangulation involved using multiple data sources to examine the research question from various perspectives,

thereby increasing confidence in the findings. Peer debriefing was also applied, where findings were reviewed by an expert in the field to enhance objectivity and refine interpretations. These measures strengthened the internal validity of the qualitative instruments, ensuring that the findings were well-grounded and reliable within the study context.

In terms of quantitative validity, a panel of experts from the Faculty of Arts and Social Sciences reviewed the instruments to assess their suitability for collecting relevant data. This panel included three experienced researchers who provided feedback on improving the clarity, relevance, and comprehensiveness of the quantitative instruments. Their recommendations were integrated to ensure that the instruments measured the intended constructs accurately. To address external validity and enhance the applicability of the findings beyond the specific context of the Dakawa Irrigation Scheme, several measures were taken. The study aimed to design instruments and sampling techniques that could capture insights representative of broader trends within similar irrigation schemes in Tanzania. This approach allows for the potential generalization of findings to other regions with comparable agricultural and irrigation challenges. By incorporating a diverse sample of stakeholders, including local farmers, irrigation board members, and government officials, the study sought to gather data that reflect broader patterns and factors influencing irrigation scheme effectiveness. These measures ensure that the findings are not only relevant to Dakawa but could also provide insights for similar projects across Tanzania and potentially other Sub-Saharan African countries with analogous contexts.

3.8.2 Reliability of Research of Instruments

For reliability of quantitative research instruments for likert scale items the researcher tested the reliability of the questionnaire by using Cronbach Alpha formula. The likert scale items in the questionnaire subjected to the formula using Statistical Package for Social Sciences (SPSS) and the alpha calculated for each questionnaire. In social science research if the calculated value for coefficient reliability is 0.7 and above it represents acceptable reliability.

3.9 Data Analysis Procedures

3.9.1 Analysis of Quantitative Data

The researcher used descriptive statistics in data analysis. For descriptive statistics data were collected through questionnaire. The data analyzed using frequencies, percentages, means, standard deviations and tables. The interpretation of data done in relation to research objectives.

3.9.2 Analysis of Qualitative Data

The researcher used thematic analysis for analyzing qualitative data. Researcher analyzed qualitative data from interview guides summarized, coded and analyzed in each theme/category and then relevant information were extracted, interpreted and discussed.

3.10 Research Ethical Considerations

Before collecting data, the researcher first asked for clearance and permission from the authorities. These include the Directorate of Post graduate Studies (DPGS) of the Open University of Tanzania, Morogoro Regional Administrative Secretary and

Mvomero District Administrative Secretary (DAS) offices. Thereafter, the researcher visited Dakawa irrigation scheme and explain the purpose of study. Confidentiality was ensured for the respondents in the sense that all information that collected were treated as confidential and used for the research purpose only. Furthermore, in relation to ethics and confidentiality in research, the researcher accepted the responsibility of ensuring that information about the subjects and their responses remain confidential and that they are used for no other purposes rather than the research for which it was intended. Similarly, the original names of individual informants were changed, instead pseudo names used.

Informed consent was also sought from individuals or groups of respondents by the researcher. The researcher informed respondents the purpose of the study. The respondents were also be briefed on how the study would be conducted and the importance of the information from the participants was made clear. The researcher informed the respondents to feel free to give the required information or withdraw from giving information. The respondents signed the consent form as an indication that they had fully decide to volunteer as research participants for this study.

CHAPTER FOUR

RESULT AND DISCUSSIONS

4.1 Chapter Overview

This chapter presents the analysis, results, and discussion of the data collected for this study. The analysis is structured around three specific research objectives: (1) to assess the role of foreign aid in enhancing farmers' capacity at the Dakawa Irrigation Scheme, (2) to examine the development of irrigation infrastructure funded by foreign aid with a focus on water use efficiency, and (3) to evaluate the role of foreign aid in strengthening UWAWAKUDA's management system. The corresponding research questions addressed include: how foreign aid has promoted farmer capacitation at Dakawa, how foreign-funded infrastructure improvements have impacted irrigation, and how foreign aid has facilitated improvements in management practices.

The analysis is based on data from a combination of primary and secondary sources. Data were gathered through questionnaires, interviews, and secondary documents from credible institutional sources and previous research. Data from the 280 distributed questionnaires were analyzed using SPSS version 20, with results presented in tables and figures. Qualitative data collected from interview guides were analyzed thematically, with key insights presented as quotations in italics.

Out of the 280 questionnaires distributed, 74 were completed and returned, yielding a response rate of approximately 26%. While these responses provide valuable insights, this low response rate introduces a risk of non-response bias, potentially limiting the generalizability of the findings to the broader population of farmers at

the Dakawa Irrigation Scheme. This limited sample may not fully represent the diverse perspectives and experiences within the farming community, which could impact the study's overall conclusions. As a result, while the findings offer useful indications of trends and insights, they should be interpreted with caution when considering broader applications.

By grounding the discussion in both quantitative and qualitative data, this chapter seeks to provide a comprehensive assessment of the contribution of foreign aid to the development of the Dakawa Irrigation Scheme. The combination of empirical data and secondary sources strengthens the study's relevance and enhances the reliability of the insights presented.

4.2 Respondents Characteristics

This first part presents background information of the respondents on questionnaire. To grasp the required information, several variables were set. Such variables include sex, age, and education level. These variables were placed purposely to help understand the status of farmers demographics. The data from questionnaire were analyzed by SPSS and presented into tables and figures.

4.2.1 Respondents Sex

The study revealed a notable gender imbalance among respondents, with males constituting 50% of the sample and females only 24%. This disparity suggests that the perspectives and experiences of female farmers, who may face unique challenges in their agricultural roles, are underrepresented in the data. The gender imbalance likely reflects broader socio-economic patterns within the community, where men

traditionally engage more heavily in visible economic activities, while women's contributions may be less documented or differently prioritized.

The limited representation of female farmers implies potential gaps in understanding the specific challenges they face in areas such as access to resources, participation in training programs, and involvement in decision-making within the irrigation scheme. Capturing a more balanced gender representation would be crucial in providing a holistic view of the Dakawa Irrigation Scheme's impact across all participants. Future research could benefit from targeted efforts to engage more female respondents to ensure their perspectives are adequately reflected, thereby enhancing the study's comprehensiveness in addressing gender-specific agricultural needs and barriers.

4.2.2 Respondents Age

The findings indicate that 2.8% of the respondents had the age between 15-25years, 9.5% age between 26-30 years, 37.8% between 31-40 years, 14.9% between 41-50 and 50 years and above 35.1%. It has been further noted from the findings that, the majority farmers were at an age of 30 years and above and are accounting 87.9%, this implies that farmers who were engaging in farming at UWAWAKUDA scheme of irrigation system were above 30 years old (Fig. 3)

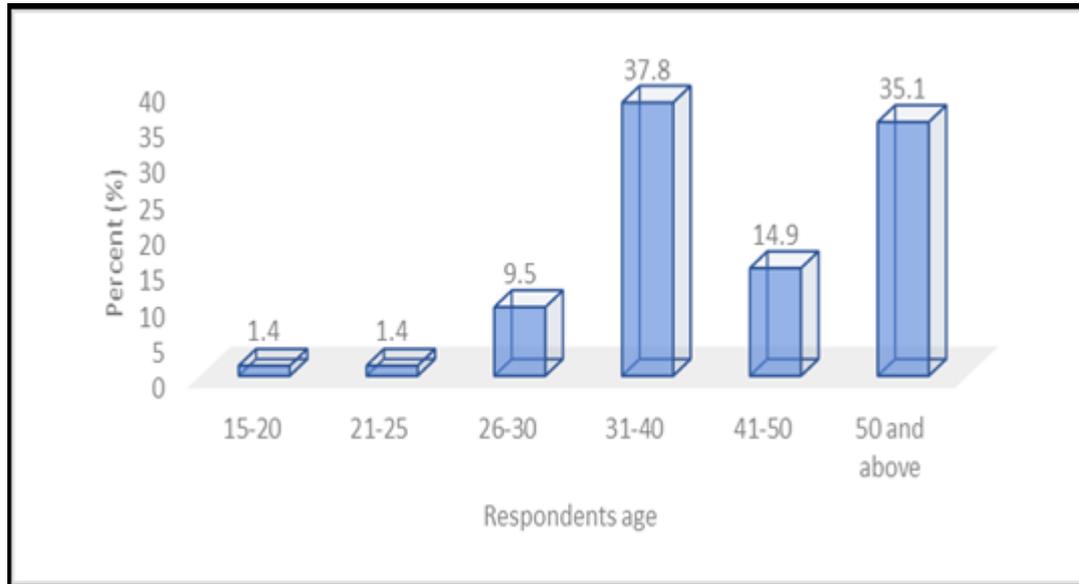


Figure 4.1: Bar graph of Respondents Age

Source, field data, (2023)

The findings indicate that most of the respondents at Dawaka Irrigation Scheme are matured enough and have long exposure and experience in agricultural activities. The respondents of this age are more active and aggressive in delivering the information's and well informed with the scheme operations. It has further been noted from the study that, the majority of the Dawaka Irrigation Scheme are male. The aim of looking on the gender distribution is based on roles and relationships between men and women in the specific societies and cultures. The findings show that, men have participated in high level compared to women and are also dominating the scheme.

4.2.3 Education Levels of Respondents

The respondents were asked to share their level of education, so the data revealed that, all levels from primary to university are existing in the scheme. For primary school 39.3%, secondary 31.1%, certificate and diploma were 14% and university

were 9.5%, this implies that UWAWAKUDA scheme is made up of different farmers education level (Table 2)

Table 4.1: Summary of Education Levels of Respondents

Response	Frequency	Percent
None	5	6.8
Primary school	29	39.2
Secondary	23	31.1
Certificate	4	5.4
Diploma	6	8.1
University	7	9.5
Total	74	100.0

Source: Field data,(2023)

With reference to levels of education, the findings show that Dakawa Irrigation Scheme is made up of all level of education start from primary, secondary, graduate and post graduate. It is possible that the suitability of the scheme was contributed by having a good number of educated beneficiaries. It is documented that, the productivity of individuals with high level of education who is engaged in Agricultural activities is also likely to be higher than of less educated farmer (URT, 2010). Using growth models Solow (1957) and Nelson (1964) postulated that education adds to the effectiveness of labour through technical progress. In general education allows people to adapt more easily to both social and technical changes in the economy.

4.3 The Support from the Donors

This section examines farmers' awareness of donor funding, the channels through which they access information about this support, and the specific contributions from development partners to the Dakawa Irrigation Scheme. By investigating these factors, the study aims to understand not only the level of awareness among farmers but also the implications of donor involvement for the scheme's long-term sustainability.

When asked if they were aware of donor funding for the project, a significant majority (83.8%) of respondents confirmed their awareness, while 16.2% were unaware (Table 3). This high level of awareness suggests that donor contributions to the project are well-publicized among the farmer community, likely due to the visibility of foreign aid activities within the scheme.

Table 4.2: Support from the Donors

Response	Frequency	Percent
Yes	62	83.8%
No	13	16.2%
Total	74	100.0

Source: Field data, (2023)

4.3.1 Media of Accessing Information from Donors

The study further explored how farmers access information about donor support. Results indicate that 59.5% of farmers received updates via village meetings, 20.3% through advertisement boards, and 4.1% through social media (Table 4). These findings underscore the importance of village meetings as a primary information

source, with nearly 85% of respondents indicating some level of awareness through various platforms. The reliance on village meetings reflects traditional information-sharing practices, yet also reveals an opportunity for enhancing communication channels to improve transparency and engagement with stakeholders.

Table 4.3: Media of Accessing Information from Donors

Response	Frequency	Percent
Village meetings	44	59.5
Social media	3	4.1
Advertisement boards	15	20.3
None	12	16.2
Total	74	100

Source: Field data, (2023)

The heavy reliance on village meetings suggests that while these gatherings play a crucial role in disseminating information, the scheme could benefit from formalizing these and other communication methods. This would not only reinforce transparency but also allow stakeholders to engage meaningfully in the decision-making processes associated with donor-funded projects.

4.3.2 The Areas Supported by Donor Funds

Respondents identified key areas where donor funds have been allocated, including provision of equipment, capacity building, infrastructure development, and input subsidies. As a retired administrator noted,

“Our project proposal targeted Tshs 18 billion, but we received Tshs 22 billion. The funds supported farm machinery purchases,

farm renovation, water supply improvements, and water pump repairs” (Retired Administrator, 2023).

The substantial financial support underscores the scale of the donor commitment to revitalizing Dakawa's infrastructure and agricultural productivity. However, a critical analysis reveals potential challenges regarding the sustainability of these investments. Heavy reliance on donor funding for essential operations, such as equipment maintenance and irrigation infrastructure, may limit the scheme's autonomy and ability to sustain these improvements independently. This dependency could lead to vulnerabilities if donor support were to diminish, underscoring the importance of building local capacities and financial strategies that can sustain the scheme's functions in the long term.

4.3.3 Development Partners' Contributions to the Scheme

The financial contributions from development partners, including Tsh. 24,179,143,957.48/= from USAID Nafaka and Tsh. 896,234,000/= from the Tanzanian government through MIVARF, represent a significant investment in the scheme's infrastructure and operational capabilities (UWAWAKUDA Report, 2023). This funding has enabled vital upgrades, such as infrastructure rehabilitation and the installation of a paddy grading machine, enhancing productivity and value-added processing capabilities.

Table 4.4: Development Partners Support the Scheme

Donor	Amount Disbursed (Tshs)
USAID	24,179,143,957.48
URT	896,234,000.00

Source: Field data, (2023)

While these contributions have evidently enhanced the scheme's capacity, there is a pressing need to evaluate how donor reliance affects the scheme's resilience and adaptability. The risk lies in becoming overly dependent on external sources for critical infrastructure and operations, which may reduce the scheme's ability to respond to future challenges independently. Establishing local revenue streams, such as user fees or cooperative-driven investments, could serve as a strategy to reduce dependency on donor funds and build a sustainable model for ongoing operations.

4.3.4 The Contribution of Foreign Aid on Irrigation Infrastructures at Dakawa Irrigation Scheme

In this section the researcher wanted to understand the extent to which the grant provided has improved the infrastructure systems from the intake to the farm blocks. Hence, a set of question revolving around the theme were set as tools to enhance capturing of both quantitative and qualitative data capturing. Opinions gathering scales such as very good, good, average and weak were used to rank the extent to which foreign aid have improved Scheme infrastructure, while structured interviews with UWAWAKUDA management as well as district Irrigation Engineer supplemented the latter.

4.3.5 The Irrigation Infrastructures Improved by Foreign Aid

The study indicates that; irrigation infrastructures improved by the foreign aid include; Water pumps, main canal, secondary canal's gets, farms routes and scheme roads. However, there was a weak improvement of the main canal 59.5 percent and secondary canal 47.3 percent (Table 6)

Table 4.5: The extent that Foreign Aid have improved irrigation infrastructure (N=74; figures in percentages)

Response	Scheme intake	Water pump	Main canal	Secondary Canal	Secondary canal gets	Farm routes	Scheme roads
<i>Very good</i>	4.1	12.2	28.4	2.7	8.1	8.1	21.6
<i>Good</i>	12.2	27	43.2	9.5	17.6	14.9	14.9
<i>Average</i>	24.3	58.1	23	40.5	60.8	51.4	59.5
<i>Weak</i>	59.5	2.7	5.4	47.3	13.5	25.7	4.1
<i>Total</i>	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Field data, (2023)

It has been noted from the study that the foreign aid improved the said infrastructures but when the project phased out and remain under the management of UWAWAKUDA the situation turned, the intake and its accessories not operate effectively, there is improper use of river water upstream before it reaches at the water collection point (a retired co-operative chairperson) It is possible that no adequate routinely irrigation infrastructures maintenance after donors put off their hands. Ineffective intake renders severe water scarcity at scheme level, poor on-farm and scheme level water management which aggravating water scarcity and finally crops yield decline. Turrall et al., 2010 found that, the low levels of irrigation management skills among smallholder farmers, bureaucracies and inefficiencies in

disbursement of funds and poor project management under government and donor programs, as well as the unwillingness to finance working capital (operations and maintenance) once the irrigation infrastructure has been put in place, have often contributed to the unsustainability and failure of many of these irrigation projects. Construction of irrigation infrastructure takes time, and the production cycle(s) of the value chain(s) chosen for irrigation will take additional time before the first batch of revenues can be realized.

Moreover, in developing-country contexts, where irrigation is often new to farmers, additional time is needed to train farmers how to effectively manage and operate the irrigation equipment and for them to reach the level of expertise needed to efficiently operate the irrigation equipment. In the absence of training, the irrigation equipment is often inefficiently managed or damaged prematurely, thus jeopardizing profitability of the whole irrigation investment (Small and Carruthers, 1991; Small et al., 1993)

4.3.6 The Extent Foreign Aid Have Improved Scheme Intake

In this respect, the researcher wanted to understand the opinions of farmers with regard to their satisfaction with the intake improvement following the rehabilitation being made. The analyzed quantitative data on this part are presented in table 8 in details. As the results show, 4.1% of the respondents were of opinion that the intake rehabilitation was very good, 12.2% said that the renovation was just good, those who saw it to be an average made 23.4% of the sample and surprisingly, those who said it is weak scored 59.5%. (Table 7). This implies that, a big percent of farmers is not satisfied with the intake renovation. This might be due to the fact that, despite the

renovation being made, still the volume of water collected at the intake cannot support cultivation exercises to be carried out in a double season per annual as per wishes of most farmers.

The same was also learnt from an interview with a senior farmer and a retired co-operative chairperson who was of opinion that there are

“Serious problems there, first, when the river starts to slow down, and sometimes when the rains are falling, it brings mud to the water collection point, they have to start removing the mud so that they can raise the water level. This is a long-term problem. Also, there is improper use of river water upstream before it reaches at the water collection point”.

The lowering volume of water at the intake has been learnt to be caused by increased use of water pump technology in agricultural activities done by small holder farmers at upstream and downstream, as well as the effects that has been brought by massive land clearance by the expansion of Mtibwa sugarcane company farms near Wami river. The massive land clearance has displaced a lot of trees and natural vegetation that is useful for rainfall formation. As a solution to this, says the senior agriculturalist,

“The government should use that 60 Meters law, a law that prevents people from engaging in agricultural activities near water sources. Also, reforestation, the exercise should be inter-ministerial, is it possible?” he asks himself a rhetorical question.

Table 4.6: Improved Scheme intake due to Foreign Aid

Response	Frequency	Percent
Very good	3	4.1
Good	9	12.2
Average	18	24.3
Weak	44	59.5
Total	74	100

Source: Field data, (2023)

It has been noted from the findings that the main problem in the intake is siltation and river diversion which have been collectively caused by human activities in catchment areas. The proposed remedial actions required is to remove the mud from the intake and direct the river in the right ways in order to have a considerable water level in the intake.

4.3.7 The Extent at which Foreign Aid have Improved Water Pumps

The variables in scales such as very good, good, average and weak were used to rank the extent foreign aid have improved water pumps. However, in nutshell for very good responses had 12.2%, 27% good average 58.1 and weak 2.7% respectively. So, the finding implied that, farmers did comment on the extent that foreign aid have improved water pumps (58.1%) contrary to 2.7% of respondents who remarked weak (Table 8).

Table 4.7: The Extent that foreign aid have Improved Water Pumps

Response	Frequency	Percent
Very good	9	12.2
Good	20	27
Average	43	58.1
Weak	2	2.7
Total	74	100

Source: Field data, (2023)

This is also evident through an interview with senior agriculturalist and retired UWAWAKUDA chairperson, who admits that,

“Initially, we had German make pump machines, which were very strong but they become damaged due to its long use. So, during the rehabilitation, following the grant from USAID, they said they would buy new 6 submersible pumps. We tried to advise them, why shouldn’t we go for the same German make, and buy only three, which appears to be strong and best, but you know, everyone has their perspectives, they said it will cost a lot of money, there were long stories. So, they took and travelled with regional irrigation engineers to various areas to learn best practices. When they returned, they acted as ambassadors and advocates, but when it came to the implementation, the pumps are not making it well. They have a lot of problems. For example, when there is mud in the river, they said the pumps are up with a technology that does not allow mud clogging, but I am not sure if they are”.



Figure 4.2: The Old and the Newly Installed Submersible Pumps at Dakawa Paddy Farms

The variables in scales such as very good, good, average and weak were used to rank the extent foreign aid have improved water pumps. The data on this part were analyzed and presented in table in details. However, in nutshell for very good responses had 28.4%, for good responses were 43.2%, for average responses were 23% and for weak were 5.4% (Table 10). Again, in this respect not all farmers are completely confident or satisfied with pumps rehabilitation and performance.

The reason for this is the fact that, the newly installed submersible water pumps are underused in the sense that, the water volume it supplies is not enough to the extent that it does not meet farmers expectations. The variables in scales such as very good, good, average and weak were used to rank the extent foreign aid have improved water pumps. The data on this part were analyzed and presented in table 10 in details. However, in nutshell for very good responses had 28.4%, for good responses were 43.2%, for average responses were 23% and for weak were 5.4%. Again, in this respect not all farmers are completely confident or satisfied with pumps

rehabilitation and performance. The reason for this is the fact that, the newly installed submersible water pumps are underused in the sense that, the water volume it supplies is not enough to the extent that it does not meet farmers expectations.,

Table 4.8: The Extent that Foreign Aid have Improved Main Canal

Response	Frequency	Percent
Very good	21	28.4
Good	32	43.2
Average	17	23.0
Weak	4	5.4
Total	74	100

Source: Field data, (2023)

This is also evident through an interview with senior agriculturalist and retired UWAWAKUDA chairperson, who admits that “we have few years since we started using the main canal. I see no any problem with regard to it, the canal slabs are still intact and the water are flowing smoothly”. A report by UWAWAKUDA has reported that almost 7.4 Kilometers were rehabilitated by flooring the under walls and slabbing the adjacent walls. The rehabilitation was part of 15,797,304,465.22 that was among other things meant for rehabilitation of scheme’s canals system.



Figure 4.3: Dakawa Paddy Irrigation Scheme Main Canal

4.4 The Extent that Foreign Aid have Improved Secondary Canals

The variables in scales such as very good, good, average and weak used to rank the extent foreign aid have improved secondary canals. The data on this part were analyzed and presented in table 19 and figure 20 above in details. However, in nutshell for very good responses were at 2.7%, for good responses were 9.5%, for average responses were 40.5% and for weak responses were 47.3% (Table 10).

Table 4.9: Foreign Aid have Improved Secondary Canals

Variables	Frequency	Percent
Very good	2	2.7
Good	7	9.5
Average	30	40.5
Weak	35	47.3
Total	74	100

Source: Field data, (2023)

It appears that farmers have partial fulfilment with the secondary canals. This might be due to the fact that since a large segment of *the secondary canals are not surfaced, so, challenges such as water crossing the boundaries occurs*, says pump station supervisor in an interview. The unsurfaced secondary canals on the other side leads to water sinking on the way to the farm blocks. This sometimes create uneven distribution of water service to the farming blocks. According to the UWAWAKUDA report, 2023, phase I of the scheme's canals system rehabilitation managed to upgrade only 6.9 kilometers of the secondary canals. This leaves out a large part of the canal system unsurfaced and it happens sometimes that the canals are filled with mud which block water runways and thus slowing down the smooth out flowing of water to the farm blocks.



Figure 4.4: A Secondary Canal Gate filled with Mud at Dakawa Paddy Irrigation Scheme

A quotation from one of the staffs emphasized that.

“We have something to do with secondary canals. The canals have sunken to a level that water gets are above the canals thus renders irrigation water unable to enter the farms. Re setting or renovations of the canals to resume their operations require irrigation specialists”

4.4.1 The Extent that Foreign Aid have Improved Secondary Canal’s Gets

The variables in scales such as very good, good, average and weak used to rank the extent foreign aid have improved secondary canals canal’s gets. However, in nutshell 8.1% of responses were in very good, 17.6% of responses were in good, 60.3% of responses were in average and 13.5% of responses were in weak (Table 11). This imply that foreign aid have improved secondary canal’s gets by 60.5 contrary to 13.5% weak response.

Table 4.10: The Extent that Foreign Aid have Improved Secondary Canal’s Gets

Response	Frequency	Percent
Very good	6	8.1
Good	13	17.6
Average	45	60.8
Weak	10	13.5
Total	74	100

Source: Field data, (2023)

The study revealed that no problem with water gates the only problem is the sinking of secondary canals.

4.4.2 The Extent that Foreign Aid have Improved Farms Routes

In this respect, the researcher wanted to determine the extent to which the foreign aid has improved the farm road network. Road network in large farms play an essential role in facilitating agricultural activities. Such activities apart from easing entrance to and exiting farms fields by pedestrians and machines, include also transportation of agricultural inputs and outputs. With that in mind, it is deemed important to have standard roads that allow passage of vehicles and pedestrians as well the road network that allow agricultural activities to be carried out through the year. In getting information about it, the researcher assigned a variable that was to be measured through Likert scales such as very good, good, average and weak used to rank the extent foreign aid have improved farm routes. The data on this part were analysed and are presented in table 13 in details. The results shown represent farmers opinions to the subject matter. In nutshell, 8.1% of farmers were of opinion that the farm road network rehabilitation is very good, while 14.9% of responded that the road network is good. The majority of responses from farmers stood at 51.4% of responses who were of opinion that the rehabilitation to the farm's road network is average, while 25.7% of responses were of view that the rehabilitation is weak (Table 12).

Table 4.11: The Extent that Foreign Aid have Improved Farms Routes

Response	Frequency	Percent
Very good	6	8.1
Good	11	14.9
Average	38	51.4
Weak	19	25.7
Total	74	100

Source: Field data, 2023

A report by UWAWAKUDA has shown that, following the 24 billion shillings grant provided by USAID, a construction company called RAVJI won a 15,797,304,465.22 bid which among other tasks was set to upgrade 38.8 kilometers road network between 2025-2019. The upgrading became a remedy as the roads in the farms became passable through the year unlike the time before the rehabilitation when the roads were unpassable. *Very few areas are showing challenges, however, when canals are maintained, it is the same time when the farm manager maintains the farm roads. It would be a bright idea if we own our excavator for the purpose,* says a senior pump station supervisor. Despite the road being passable throughout the year, the retired UWAWAKUDA chairperson warns that there appears to be chances of future degrading the road network *because “the kind of maintenance which is done today takes out the already existing murrum instead of replacing it with the new one”*.



Figure 4.5: One among the Feeder Roads Heading to Dakawa Paddy Farm

4.4.3 The Extent that Foreign Aid have Improved Scheme Roads

The response in scales such as very good, good, average and weak used to rank the extent foreign aid have improved scheme roads. However, the finding shows that 21.6% of responses were in very good, 14.9% good, 59.5% average and 4.1% weak (Table 12). This imply that foreign aid have improved scheme roads gets by 59.5 contrary to 4.1% weak response.

Table 4.12: The Extent that Foreign Aid have Improved Scheme Roads

Response	Frequency	Percent
Very good	16	21.6
Good	11	14.9
Average	44	59.5
Weak	3	4.1
Total	74	100

Source: Field data, (2023)

4.4.4 The Contribution of Foreign Aid on Farmers' Capacitation at Dakawa Irrigation Scheme

The survey was also conducted to examine the contribution of foreign aid on farmers' capacitation. Information gathered through an interview held with an old and a well-experienced farmer, on whether foreign aid positively impacted farmers knowhow on agricultural practices. Basing on the finding results, the farmers capacitation carried out by the foreign aid include; Agricultural technologies, financial and capital support, agricultural inputs and agricultural technologies against the climate change. It was therefore learnt that the aid provided trainings in various agricultural areas.

The farmer admitted that they were occasionally trained as the interviewed farmer said,

“By the time farmers were going to Moshi for training in paddy production, indeed we were in the darkness in paddy production technologies. Everyone had their own understanding on agricultural practices, the ones who were at least knowledgeable, had somehow good harvest as compared to those who were not. We were satisfied

if someone harvested eight to ten bags per acre. While at Moshi, we were trained on the proper use of fertilizers, efficient use of seeds”.

The findings confirm the fact that farmers received trainings. They further identify outstanding contribution in various agricultural aspects as use of improved inputs, financial opportunities and farming methods. The survey question had binary response options YES and NO. As the table below shows, when farmers were asked about whether they received training during the funding period, 79.7% of respondents said YES, they have been trained to update the knowledge about cultivation while on the other side about 20.3% their said no trainings they had received (Table 13). This implies that, Dakawa irrigation scheme farmers were adequately imparted with relevant skills and knowledge on Agricultural technologies, facilitation on accessing financial and capital, agricultural inputs in order to cope with the climate change.

Table 4.13: Trainings About Improved Agriculture

Response	Frequency	Percent
Yes	59	79.7
No	15	20.3
Total	74	100

Source: Field data, (2023)

4.5 Training Supporters

The findings indicate that, the majority 52.7% of the respondents agree to be facilitated by donors, 12.2% by NGOs, 12.2% by Government, 6.8% others, 2.7% experienced farmers and 13.5% are not aware who facilitated the project (Figure 6). This implies that, farmers were aware of the facilitators of the trainings.

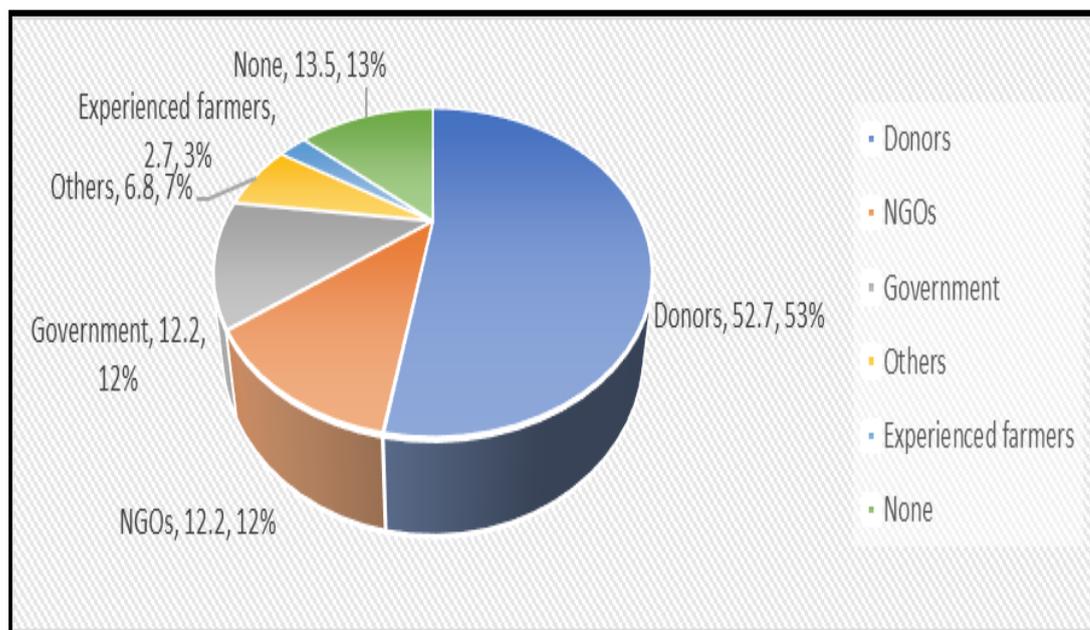


Figure 4.6: Entities that Facilitated Trainings at Dakawa Paddy Irrigation Scheme

Source: Field data (2023)

Despite the fact that UWAWAKUDA appear to have been receiving training support from different partners, it has been learnt that the engagement of local and the project host Mvomero district council in this regard, was not a priority of the fund. An interview carried out with one of the senior irrigation engineers in the district irrigation department it was discovered that the information about farmers’ training were obtained from farmers themselves who admitted to have received training”, says engineer. However, the biggest challenge

“The project faced, is the overall involvement of the council, we partially involved in the project because we didn't have a project implementation document, although it was initially stated that the project had to be implemented for 12 billion shillings. However, there was a variation of over 10 billion in the implementation of the project. So, we used to see them being trained, technical team that was involved in construction, a team for training purposes, a white woman who used to deal with building capacity of the farmers and the leaders of the scheme”.

On the other hand, the UWAWAKUDA report has shown that, the cooperative has been training at least 50 farmers every year. Where, until the time of writing this research report, a least 400 UWAWAKUDA cooperation members had received training on various agricultural activities. Therefore, regular trainings to farmers have significantly contributed to the increased of production and productivity in the farms, (UWAWAKUDA report, 2023)

4.5.1 Areas to which Trainings Focused

When the researcher asked the farmers about key focused areas of trainings, the responses were categorized into the following variables such as 24.3% water use and storage, 21.6% use of improved seeds, 20.3% farm cleanliness 16.2% use of fertilizers, 10.8% water use and storage and 6.8% harvesting and storage. The implication is that, farmers conquered with the notion that training which were provided focused on those findings s presented (Table 14)

Table 4.14: The Key Focused Areas of the Trainings

Response	Frequency	Percent
Use of improved seeds	16	21.6
Use of fertilizers	12	16.2
Water use and storage	18	24.3
Harvesting and storage	8	10.8
Farm cleanliness	5	6.8
None	15	20.3
Total	74	100

Source: Field data, (2023)

Farmers are knowledgeable on application of agronomical practices in paddy production. The agronomic practices applied include the use of improved seeds that have good yield, early maturing and resistant to biotic and abiotic factors. The use of fertilizers (basal and top dressing), folia fertilizers, when to apply the fertilizers and the recommended fertilizers in their respective fields. They also know how to use irrigation water to maximizing yield regardless of the existing climate change. The foreign aid enabled farmers to access financial opportunities, agricultural inputs availability and use, agricultural skills and technologies on how to combat the climate change catastrophes (Board members,2023)

4.5.2 Agricultural Activities Improved Due to The Trainings

The respondents were asked whether the trainings offered had any implication in their agricultural undertaking and they gave the following remarks; The majority 9.5% claimed the use of improved seeds, 8.1% fertilizers use, 8.1% production techniques 6.8 sowing techniques, 2.7% the use of insecticides, 2.7%, 1.4% climate change respectively (Table 15).

Table 4.15: Agricultural Activities Improved Due to The Trainings Provided

Response	Frequency	Percent
Sowing techniques	5	6.8
The use of improved seeds	7	9.5
Fertilizers use	6	8.1
The use of insecticides	2	2.7
Harvesting	1	1.4
Production techniques	6	8.1
Climate change	2	2.7
None	45	60.8
Total	74	100

Source: Field data, (2023)

It is possible that, the respondents have improved paddy production and productivity through using the cultivars with high yielding capacity, suitable pest and diseases control methods, fertilizer use, appropriate planting and harvesting time. Foreign aid in the management of UWAWAKUDAs Irrigation scheme covers the following components; farms cultivations routines, facilitations required in order to improve number of cultivations per season, size of land cultivated before and after the project interventions, harvesting volumes before and after the foreign aid support, agricultural practices adopted before and after the project, conditions put forward by donors regarding the project implementation.

4.6 Number of Cultivations Per Season

The collected data indicate that 97.3% of the respondents used to cultivate once per season, 2.7% of respondents cultivate more than one per season (Table 16). This presentation revealed that, before the advancement of the scheme the respondents

used to cultivate once per season. It was very difficult to control water and some time they faced erratic drought which rendered them cultivating once per season.

Table 4.16: Number of Cultivations Per Season

Response	Frequency	Percent
Once	72	97.3
More than one	2	2.7
Total	74	100

Source: Field data, (2023)

They added that inadequate water availability was the major causes of cultivating once per season. One senior from the management was quoted as saying:

“After seeing climate changes that it has affected water availability, farmers agreed that farming season should begin mid-March. This is considered to be a proper time because, even if the water in canals will not be enough it will be supplemented with rain water. However, this time at the AGM, it was advised to change the starting month. It was agreed that the season should start early, so we started the season in February. But I think we got too many problems because a lot of people had their nurseries dried up, there was not enough water to bring to the blocks. The rain shortage brought us a lot of problems. However, we are grateful for the rain as it eventually rained”.

4.6.1 Reasons for Cultivating Once Per Season

Reasons for the respondents to cultivate as per times they mentioned above. Two variables were worth mentioned under this contention, first was due to normal procedures and the second was due to water availability. Then the data revealed that 93.2% of farmers agreed that water availability is the major cause of them to

cultivate one season while others opinions were at 6.8% of those whose answer was normal procedures (Table 17).

Table 4.17:: Reasons for cultivating once per season

Response	Frequency	Percent
Water availability	69	93.2
Normal procedures	5	6.8
Total	74	100

Source: Field data, (2023)

“Climate changes has affected water availability, farmers agreed that cultivation season should begin mid-March. This is considered to be a proper time because, even if the water in the canals not enough it will be supplemented with rain water”. (Retiree CEO, as a farmer,2023)

4.6.2 Facilitations Required in Order to Cultivate More Than One Season

When the respondents were asked to propose the facilitations required to enable them to increase number of cultivations per season they came up with the following remarks; 55.4% proposed construction of water reservoirs, 9.5% increasing water supply, 4.1%, conservation farming, 12.2% improving water sources and 18.9 did not say anything. This envisaged that, respondents proposed facilitation of water reservoirs and water supply availability as the main source to the number of cultivations per season.

When the respondents were asked to propose the facilitations required to enable them to increase number of cultivations per season the majority proposed the construction of water reservoir. This means that, facilitation of water reservoirs will enhance

water supply and allow cultivation more than once per season hence will improve crops production and productivity. The findings show that investments were largely implemented through foreign aid but nonfunctional cooperatives or water users' association, with little or no capabilities of implementing fees (pricing) of irrigation services and water access.

4.6.2.1 Land size cultivated before the project

The collected data indicate that, 28.4% of the respondents cultivated 1-2 acres, 21.6% cultivated 3-5 acres, 20.3% cultivated 6-10, 13.5% cultivated 11-15, 4.1% cultivated 15-20 acres and none figure comprised 12.2% (Fig 7). This presentation revealed that, before the advancement of the scheme the farmers were able to cultivate between 1 and 20 acres of land by 88.1% of them and for 12.2% did not remember the exactly number of acres they used to cultivate.

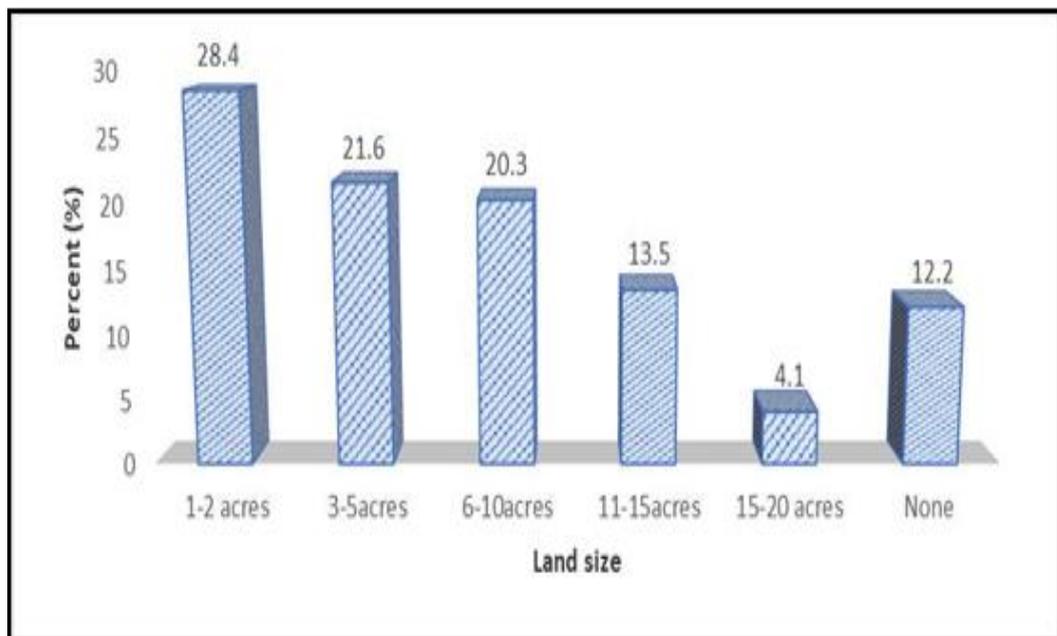


Figure 4.7: The Area (Acre) Cultivated before the Project

4.6.3 Number of Bags (7tins) Produced Before Project

The findings indicates that, 47.3% of the respondents used produce 30 bags and above, 13.5% produced 16-20 bags, 10.8% produced 6-10bags, 8.1% produced 11-15bags, 6.8% the 1-5 bags, 5.4% produced 1-5bags (Table 18). The findings s confirmed that, 47.3% of respondents alleged that they used to harvest 30bags and above before the project.

Table 4.18: Number of Bags (7tins) Produced before Project

Response	Frequency	Percent
1-5 bags	4	5.4
6-10 bags	8	10.8
11-15 bags	6	8.1
16-20bags	10	13.5
21-30 bags	5	6.8
30bags and above	35	47.3
None	6	8.1
Total	74	100.0

Source: Field data, (2023)

A nine (9) years production trend analysis by UWAWAKUDA has shown than the size production before the injection of fund was between 1-2 tons per hecter. According to UWAWAKUDA report (2023) the reasons for the poor yields were due to;

- a.* Farmers used poor seeds.
- b.* Farmers spread seed instead of sowing the seedlings first. The use of poor fertilizers.

- c.* Proliferation of uncontrolled weeds famously known as “punga zeze and punga pori”.
- d.* Poor irrigation infrastructure that caused a lot of water to be lost underway to farm fields.

4.6.4 Agricultural Practices before the Project

The variables in agricultural practices before the projects seen in normal practices with 8.1%, rained fed farming 13.5%, irrigated farming 31.1%, broadcasting of seeds 32.1% and none responses 8.1% (Table 19). The findings s revealed that, majority of farmers used irrigation farming and broadcasting seeds.

Table 4.19: Agricultural Practices before the Project

Response	Frequency	Percent
Normal practices	6	8.1
Rained farming	10	13.5
Irrigation farming	23	31.1
Broadcasting of seeds	29	39.2
None	6	8.1
Total	74	100

Source: Field data, 2023

Basing on the findings, some of the common agricultural practices applied before the project include; broadcasting of seeds, flooding irrigation- the irrigation with little water control in the fields, the use of recycled seeds and rainfed farming. The practices were common because the farmers were not knowledgeable enough to apply the recommended agronomic practices in paddy production.

4.6.5 The Size of Land Cultivated after the Project

The findings show that, the size of the land cultivated after the project were as follows, 23% cultivated 1-2 acres, 28.4% cultivated 3-5 acres, 18.9% cultivated 6-10 acres, 23% cultivated 11-15 acres and 30 6.8% cultivated 30 acres and above. This presentation revealed that, after advancement of the scheme the farmers are able to cultivate between 1 and 30 acres of land. However, the majority cultivate 3-5 acres and a few 6.8% cultivate above 30 acres (Fig 8).

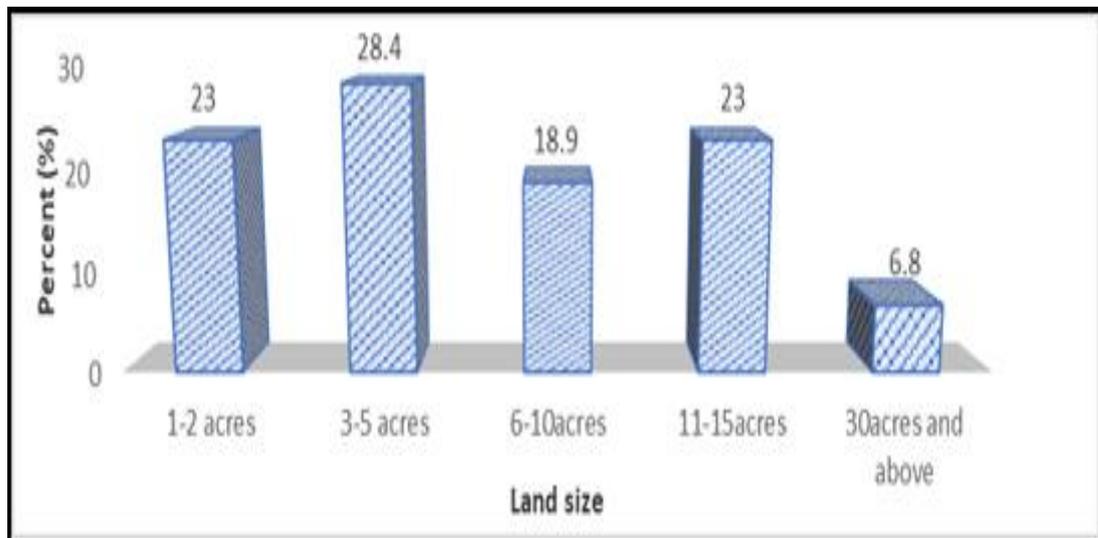


Figure 4.8: The Size of Land Cultivated After the Project

Source: Field data, (2023)

The findings show that, the area cultivated before the project was 432 acres with a total production of 5,970 bags and the productivity (bags/acre) was at an average of 14 bags. Follow the interventions of Donors, the area cultivated increased from 432 to 523 acres with a total production of 14,411 bags and the productivity of 28 bags of 7tins per acre. On the other hand, the production and productivity improved as twice

as much in Dakawa irrigation scheme after the donors' interventions. It has been proved that continued reliability on rainfall in agriculture cannot sustain the increase in population. The potential implication of the current irrigation systems is that if irrigation is managed properly it may lead to sustainable increases in agricultural productivity and income, thus alleviating rural poverty (Mwakalila, 2006). According to UWAWAKUDA report 2023, the total size of land that was granted by NAFCO to UWAWAKUDA LTD was 3225.15 hectares. However, currently, 62 % i.e 2000 hectares are being cultivated. UWAWAKUDA members have been given 58.9 % that is 1900 hectares, 100 hectares have been given to TARI, an institute which deals with researching and improving seeds. 'None of the land piece of land remain uncultivated' says senior pump station supervisor. But why the remaining 38% of the land remain uncultivated? According to district senior irrigation Engineer, budget constraints has been a major setback despite the fact that the remaining land area being surveyed and detailed feasibility study already has been conducted. According to UWAWAKUDA management board, the estimated budget for developing the remaining 1000 hectares has been estimated to be around Tsh. 12,714,737,194.99 (UWAWAKUDA, 2023).

A senior pump station argues that, following population growth and age growth of Dakawa residents, the agricultural land is now increasingly becoming scarce, the competition is getting tense, those who used to be children are now adults, they also want a land for cultivation, so, there is a need for having another agricultural land.

4.6.6 Number of Bags (7 tins) Produced after the Project

When the respondents were asked to mention number of bags produced after the project they came up with the following remarks, 78.4% produced 31 bags and above, 18.9% produced 21-30bags, 1.4% produced 16-20 bags and 1.4% had no answer (Table 20).

Table 4.20: Number of Bags (7tins) Produced after the Project

Response	Frequency	Percent
16-20 bags	1	1.4
21-30 bags	14	18.8
31 and above	58	78.4
None	1	1.4
Total	74	100.0

Source: Field data, (2023)

The findings s revealed that, the majority of respondents alleged to harvest 31bags and above after the project, the increased number of bags was probably caused by application of improved agronomic practices such as the use of fertilizers, applications of improved seeds, appropriate spacing, appropriate water supply, pests and diseases management as well as good harvesting and storage.

4.6.7 Comparison on Paddy Production before and after the Project

The findings indicate that before the project the majority (47.3%) farmers in Dakawa Irrigation scheme used to produce 30 bags per acre and above against 78.4% after the project. On the other hand, the number of farmers harvested 30bags of paddy and above increased from 47.3% to 78.4% with a variation of 31.1%. The increased in number of farmers harvesting 30 bags and above was probably contributed by the

project interventions. However, before the project farmers used to produce an average of less than 16 bags per acre against above 16bag per acre after the project. On the other hand, no farmer produced less than 16bags per acre after the project (Fig 9).

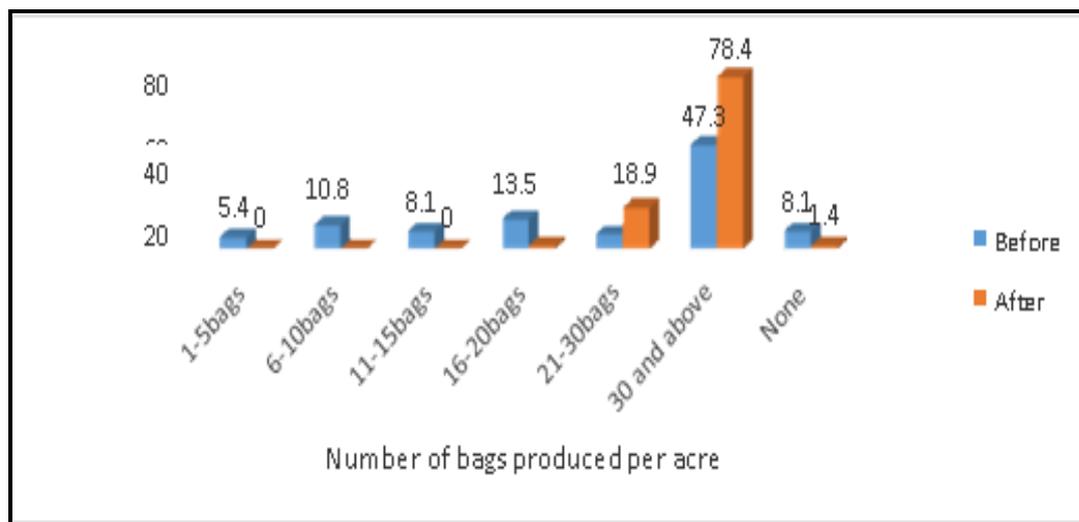


Figure 4.9: Paddy Production before and after the Project

Source: Field data, (2023)

According to UWAWAKUDA report (2023), soon after funding and rehabilitation of farm infrastructure and adoption of new agricultural techniques, there has been significant growth of paddy production per hectore where the annual average production has significantly moved from 2 to 6 tons per agricultural season. Furthermore, total annual average production has also significantly increased from 3800 tons in 2013, to 10091.1 tons in 2022. Table 21 shows the production trend from 2014-2022.

Table 4.21: Paddy production and productivity for the past nine years (from 2014 to 2022)

Year	2014	2015	2016	2017	2018	2019	2020	2021	2022
Ton/ha	4	5.6	6.8	6.5	6.5	7.2	5.4	6.3	6.0
Tons	7600	10,640	12,920	12,350	13,350	13,650	10,260	11,970	11,400

Source: UWAWAKUDA Report, (2023)

4.6.8 Paddy Production and Productivity

The finding show that the area cultivated before the project was 432 acres with a total production of 5,970 bags. The productivity (bags/acre) was at an average of 14. The area cultivated after the project was 523 acres with a total production of 14,411 bags. The productivity is at an average of 28 bags per acre after the project interventions (Table 22).

Table 4.22: Paddy Production and Productivity before and after the Project

Response	Before the project	After the project
Area cultivated (acres)	432	523
Number of bags produced (7tins)	5,970	14,411
Productivity (bags/acre)	14	28

Source: Field data, (2023)

Paddy productivity has increased due to the project interventions, an average 35-40 bags of 7tins per acre equivalent to 360-400 bags per 12 acres are currently harvested. In the past, we had no use of improved seeds nor fertilizers and the farmers used to harvest 20-30 bags per acre, says one of the interviewees. The improved production and productivity have alleviated farmers' incomes throughout

the year, thereby addressing cash flow problems often faced by the Dakawa households. In the absence of the project, dry spells occurred during the rainy season and induced overwhelming effects on rain-fed crop, as recently witnessed in the country during the crop season 2021/2022. The project has been shown to improve food security and climate resilience, while offering opportunities for improved livelihoods from commercial production and sale of paddy.

4.6.9 The Achievements Attained Through the Trainings

This part placed various variables guided the collection process. Such variables included, income increase-which scored 48.6%, construction of a house scored 4.1%, improved agriculture scored 12.2%, increased productivity scored 4.1%, good yield 1.4% and 29.4% for none responses. The description showed that 48.6% of farmers had agreed upon income achievement through trainings whereas 29.4% responded none (Fig 10).

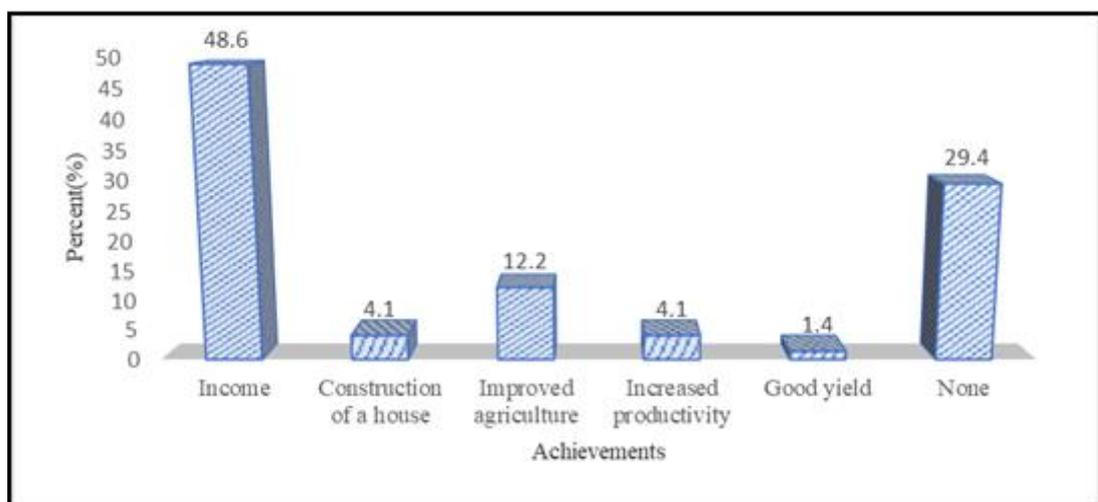


Figure 4.10: The Achievements attained after Receiving Improved Farming Trainings

Source: Field data, (2023)

A quotation from one of the staffs emphasized that; “Before the trainings, the farmers used to harvest an average of 2tons of paddy per hectare but after the trainings are harvesting an average of 6tons per hectare. He added that before the project farmers used to cultivate 12 acres and harvest 70 bags of 7tins but after interventions 360-400 bags are harvested in the same area. Previous, farmers were not knowledgeable enough to control salt affected soils but after the trainings they know how to suppress salt in the farms through application of supplement fertilizers”

4.6.10 Accessing Agricultural Inputs

When the respondents were asked to identify the areas supported by the received fund they replied as follows, 62.2% equipment, 17.6 trainings, 9.5 infrastructures, 6.8% none, while only 4.1 said that the fund supported agricultural inputs. Therefore, the data from farmers on the purpose of the received fund to support the scheme on various areas with a specific consideration to agricultural inputs as presented on table 23 reveal that, the farmers were not confident of the purpose of the fund in supporting agricultural inputs.

Table 4.23: The Project Support Areas

Response	Frequency	Percent
Equipment	46	62.2
Agricultural inputs	3	4.1
Trainings	13	17.6
Infrastructures	7	9.5
None	5	6.8
Total	74	100

Source: Field data, (2023)

4.6.11 Access to Finance

Productivity in agriculture is relative to the amount of fund invested. It from the same thinking that this research wanted to understand whether farmers received financial support from the grant that was given to UWAWAKUDA cooperative. In an interview with one of the cooperative's management board officers, it was discovered that the grant was not meant for loaning. Following the good performance of scheme, some financial institutions such as banks (CRDB and NMB) have entered the area and are currently providing loan support to the UWAWAKUDA farmers. However, one of the interviewees had a reservation on that saying that the loans have turned to be a burden to some farmers because some have misused the loans and they have their houses being sold by banks. He argues that the amount that farmers receive is huge i.e 20,000,000/= per 1 Ha, to the extent that it turns to become a burden to farmers when the time for paying it back arrives. So, *“actual production cost should be reassessed such that the amount given as loans doesn't surpass actual paddy production costs”*.

4.7 The Role of Foreign aid in UWAWAKUDA'S Management System at the Dakawa Irrigation Scheme

The information on this area was asked to the management using interview tool and more information was supplemented by secondary data from credible cooperative documents. The central objective was to understand how foreign aid has contributed to the improvement of the following; maintenance and rehabilitation of infrastructure, improvement in water services in farms and land allocation rights.

Table 4.24: Foreign Aids Contributions to Improvement of the Scheme's Management Systems

Response	I absolutely agree (%)	I agreed (%)	None (%)	Not agree (%)	I absolutely Disagree (%)	TOTAL
Water for irrigation is available throughout the year	80.0	0.0	20	0.0	0.0	100.0
The land and water are well coordinated and is fairly distributed among all farmers.	20.0	40.0	20.0	0.0	20.0	100.0
The irrigation infrastructure is regularly rehabilitated and maintained	0.0	0.0	60.0	20.2	20.0	100.0
Improving sustainable agricultural technologies that are withstand the climate change effects	40.0	20.0	40.0	0.0	0.0	100.0
Regular training of the scheme management leaders in order to strengthen their skills	20.0	20.0	20.0	0.0	40.0	100.0
Farmers are regularly trained in order to strengthen their skills	20.0	20.0	20.0	40.0	0.0	100.0

Source: Field data, (2023)

4.7.1 Maintenance and Rehabilitation

In an interview with the management in the management board of UWAWAKUDA it was learned that 40% disagreed that there was a routinely irrigation infrastructures maintenance and rehabilitation. They added that during the funding and project takeoff period, training was given to the scheme's management and technical team for the purpose of maintaining and rehabilitation (Table 25). For example, between 2018-2020 pump station operators were trained on how to run and maintain the newly installed submersible pumps. Apart from that, the scheme has established routine maintenance of farm drainage systems, road networks as well as the water intake point. However, "the challenging part of it is lack of cooperative's self-owned implements such as excavators and farm trucks that would have been used for maintaining the infrastructure at lower costs", says one of the staff in pump station section. According to the scheme's management board, the cooperative has been renting the farm maintenance and rehabilitation implements from construction companies, this fact has caused farm's costs of operations and maintenance to escalate (UWAWAKUDA, 2023)

4.7.2 Water Rights and Land Rights

Regarding the issue of water availability to farmers, this research has come to establish that 60% of the respondents agreed that, the water service to farmers is well coordinated and is fairly distributed among all farmers (Table 25). There is a special team that works for that purpose. The team communicates everyday with block leaders such that if there emerges any challenge, the responsible person takes care of it. Nevertheless, on the side of land ownership, the research has noted from

interviews with UWAWAKUDA management board staff and Irrigation Engineer that, despite the initiatives taken by the government to review land ownership status by individual farmers and the subsequent efforts to rehabilitate the farm infrastructure, there still exists intense competition in issue of land ownership because of population increase at Dakawa township and nearby cities of Morogoro and Dodoma, says one of senior farmers. According to the irrigation Engineer, there exists no piece of the developed land that remains unused in the scheme.

4.7.3 Allocation of Foreign Aids

The Government proposed to establish a temporary board that would have supervised the ethics and laws governing the farmers organization. Before the project, there was no strong farmers organization. The prevailed organization leaders by then had no good control over the organization fund. When the USAID arrived the first assignment was to recruit her expertise from Norway and other foreign countries. The local expertise's were used as consultants and were stationed at Morogoro Region. Farmers and expertise were fully engaged during the project inception. Farmers in collaboration with the expertise were given a questionnaire to identify the basic challenges prevailing in the scheme and at last the priorities were given to 6 setbacks that were presented in the overall budget. Fund management and disbursement were under the control of USAID. Before implementation of the project commence, *USAID put conditions that, land acquisition right should be on place. It was very difficult to obtain the document at District Council level as we went further to President's office where we managed to get the document the year 2012 (Retiree CEO, administrator, Irrigation engineer).*

4.7.4 The Challenges Facing Dakawa Irrigation Scheme

Climate change-The climate change has definitely affected the overall performances of the scheme. The majority farmers are merely relying on river water for irrigation. The habitually dry spell fueled by the climate change catastrophe has positively caused inadequate water supply to the existing irrigation area. One of the main solutions to the problem is the construction of water reservoir in order to ensure constantly and adequate irrigation water supply throughout the seasons. Basing on the scheme irrigation engineer views. The majority farmers cultivating once per season so if availability of irrigation water assured the number of cultivations per season can be doubled.

The engineer added that the Scheme contributes 90% of the Mvomero District Council and nearby farmers revenues (Irrigation Engineer). Scheme institutional coordination framework are overlapping: It was discovered that there exist no good coordination structures between the Ministry of Agriculture through National Irrigation Committee section, Mvomero District Council and the scheme management. On the other language, each section has its own planning against the scheme. The poor coordination has been contributed to underperforming of the scheme as the directives from the government geared to improve the scheme not adequately addressed and implemented accordingly. The solution to this is for the Ministry of Agriculture to reviewing her policy and initiate an entity that will supervising all the irrigation schemes in the country in order to get rid of the existing dilemma. All the irrigation sections from the District Councils should report directly to the National Irrigation Committee says.

“Take an example of Tanzania Rural Road Agency (TARURA) all the issues related to rural road in local Governments are supervised and managed by TARURA. Therefore, activities related to irrigation should be managed and supervised by the National Irrigation Committee and this should be gone parallel with re-allocation of the Irrigation Engineers from the District Councils to the National Irrigation Committee. The exercise should go parallel with preparations of annual budgets for implementations”.

Storage and value addition infrastructures: This research has learnt from UWAWAKUDA farmers and the management board that, despite the good performance of the project, unreliable value addition infrastructures such as paddy processing and packaging machines have been mentioned to be a major setback factor to realizing the optimum performance of the project. On the side of storage for instance, currently the UWAWAKUDA farmers store their paddy in their local stores or private warehouses. Such kind of storage renders low quality control of paddy and wastage of the government revenues. Owing to the lack of reliable storage facilities, the cooperation overtime runs into shortage of bulk reserve of paddy produces. Hence, the cooperation fails to contract the big buyers and then farmers end up selling their process while at the farm or at the lowest paddy (UWAWAKUDA report, 2023). Regarding the lack of value addition infrastructure such processing and packaging machines, it has been reported by several farmers that such factor causes farmers to sell their produces while unprocessed. This fact hinders UWAWAKUDA cooperation to secure better and more profitable from local and international markets.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 Chapter Overview

This study focused on determining the contributions of foreign aid on development of Dakawa Irrigation Scheme in Morogoro, Tanzania. Discussion on the findings has been made in the previous chapter. This chapter therefore dwells on concluding and providing policy and research recommendations. The chapter is organized into three parts. First, the chapter will provide the study's conclusion, second, policy-based recommendations following issues presented and learnt by this research project and finally, recommendations about further areas of research will be provided in the third part of this chapter.

5.2 Conclusion

This study concludes that, despite notable challenges—including inadequate stakeholder engagement, underperformance of some irrigation infrastructure (such as secondary canals and irrigation pumps), and discrepancies between planned and actual budgets—the foreign aid support from USAID, totalling Tsh. 24,179,143,957.48, has significantly contributed to the development and improvement of the Dakawa Irrigation Scheme. The funding has been pivotal in enhancing farm irrigation infrastructure, with visible improvements in the main canal, farm roads, and feeder routes. These developments have collectively boosted agricultural productivity, contributing to higher income levels among farmers and supporting the growth of Dakawa township.

In addition to infrastructure, foreign aid has positively impacted farmer capacitation through training in agricultural techniques and access to critical inputs such as fertilizers and financial services. Farmers who participated in the scheme report an enhanced understanding of sustainable farming practices, which has increased their productivity and resilience to climate variability. As one farmer noted, “The support has not only improved our farm yields but also our knowledge on modern farming techniques, which is something we had struggled to access before” (Farmer, 2023). Such insights from local farmers underscore the importance of capacity-building efforts as a core component of foreign aid’s contribution to agricultural development.

The scheme's management, represented by UWAWAKUDA, also acknowledges that foreign funding has led to significant improvements in operational supervision, from intake facilities to irrigation distribution. A scheme manager highlighted, “With the donor funds, we’ve been able to maintain a more consistent water supply, something that was difficult to achieve before. However, challenges remain in maintaining some of the secondary canals and water gates, which still require additional resources” (Scheme Manager, 2023). This feedback from management underscores both the successes and remaining challenges in ensuring the scheme’s operational effectiveness.

Government officials at the National Irrigation Commission and the local district level have noted that the Dakawa scheme, through UWAWAKUDA, has become a valuable source of revenue and employment in the region, providing 5,000 seasonal jobs annually and contributing Tsh. 188,100,000 to national irrigation funds. Officials emphasize that these economic benefits contribute to local development,

helping improve standards of living for Dakawa's residents. Additionally, through UWAWAKUDA's Corporate Social Responsibility (CSR) initiatives, a budget of Tsh. 9,500,000 has been allocated annually, with Tsh. 114,000,000 directed to community projects such as school construction in Dakawa ward, further solidifying the scheme's role in local socio-economic development.

The study also highlights recommendations from stakeholders for further support. Local farmers and scheme managers have identified secondary canal maintenance and equipment upgrades as critical areas requiring immediate intervention to sustain current productivity levels. Government and policy-makers are encouraged to explore mechanisms for ongoing local funding and community-driven initiatives to reduce dependency on foreign aid and enhance the scheme's sustainability.

In sum, the findings underscore the substantial role of foreign aid in transforming the Dakawa Irrigation Scheme, but also reveal that continued attention is required to address residual challenges. By incorporating the perspectives of local farmers, management, and government officials, this study provides a holistic view of the scheme's effectiveness and outlines pathways for sustainable growth in similar agricultural projects. These insights could serve as a model for enhancing the impact and sustainability of foreign-aided irrigation schemes across Tanzania.

5.3 Recommendations

5.3.1 Recommendations to the Ministry of Agriculture

It was revealed from the study that the majority farmers in the Dakawa irrigation scheme fail to cultivate more than one season owing to insufficient irrigation water. However, during their interview the majority proposed construction of water

reservoir in order to ensure adequate irrigation water supply in their scheme especially during dry season. They added that, in order to maintain food security, economic and social benefits of agricultural in the face of known climate variability and anticipated climate change, improvement of irrigation infrastructures especially construction of water reservoir is inevitable.

The finding indicates that there are substantial foreign aid received and have been allocated to improve the irrigation infrastructures such as Intake, Main canal, secondary canals, scheme routes and scheme roads. The performance of improved irrigation schemes has gradually improved in terms of water management and crop yields. For example, paddy yields of up to 6 t/ha have been achieved by some smallholder farmers who access water for irrigation, but for those who are cultivating in undeveloped farm yield range from 1.5 to 2t/ha due to the difficulties to regulate water levels in their fields. Despite all these potentials only 2,000ha have been so far developed under irrigation compared to the cultivated land estimated to be 3,225.15ha, the area currently developed for irrigated agriculture is merely 66%. Base on this, the findings recommend that the remaining 1000ha of land have to be developed, parallel with main and secondary canals. Thus, creating a financing facility for increased irrigation investment will be a critical strategy for overall commercialization of agriculture, as specified in the National Agriculture Policy that requires an agriculture to grow by 10% by the year 2030. It has been also noted from the study that, there is no reliable markets infrastructures such as warehouses and paddy processing machines in Dakawa irrigation Scheme. The majority farmers store their paddy in their local stores or private warehouses. Such kind of storage renders

low quality control of paddy and wastage of the government revenues through crop. It is high time for the Ministry of Agriculture through Agricultural Development Bank (ADB) to deliberately constructing storage infrastructures parallel with installation of paddy processing plants at Dakawa irrigation scheme as this will enhance farmers income and the government revenues through commodity value addition.

The research has also noted that there is a poor institutional coordination framework between the Ministry of Agriculture through National Irrigation Committee section, Mvomero District Council and the scheme management team. In other language, each of the aforementioned institutions, works independently in the same scheme. The existing misunderstanding has been contributing to underperforming of the scheme as the directives from the Central government geared to improve the scheme not adequately addressed and implemented accordingly due to the lack of harmony among partners. Following that, this research recommends that, the Ministry of Agriculture and Irrigation has to review and improve the schemes management structures such that all irrigation stakeholders for instance, all the staff from the District Councils with irrigation schemes, report directly to a National Irrigation Development Committee Management and not to the District Executive Directors as stipulated in the existing staff standing order. Take an example of Tanzania Rural Road Agency (TARURA), all the issues related to rural road in local Governments are supervised and managed by TARURA.

5.4 Recommendations for Further Studies

This study identified two key areas where further research could provide valuable insights into the effectiveness and sustainability of foreign-aided irrigation projects in Tanzania.

One area involves examining the coordination framework among major stakeholders, including the Ministry of Agriculture, the Irrigation Development Committee, District Councils, and Irrigators' Associations (IOs), in the development and management of irrigation schemes. Research could explore specific aspects such as decision-making processes, resource allocation, and policy implementation. Further investigation into the clarity of roles, communication flow among agencies, and the influence of these factors on the efficiency and maintenance of irrigation infrastructure would enhance understanding of how well this framework supports project goals. This type of study could utilize stakeholder interviews, surveys, and case studies to analyze how coordination impacts project outcomes across various schemes.

Another area for future study focuses on identifying factors that influence the sustainability of foreign-aided irrigation projects. This includes analyzing both internal and external influences on long-term project viability. Relevant internal aspects might include the capacity and financial independence of local management bodies, such as UWAWAKUDA, and the development of technical expertise at the community level. External influences could encompass economic stability, government policy support, and environmental issues like water scarcity and climate variability. A mixed-methods approach, combining quantitative project performance

data with qualitative insights from stakeholders, would be effective for uncovering practices that promote or hinder sustainability.

These recommended studies would contribute significantly to improving the coordination and resilience of irrigation projects, ensuring that foreign aid has a lasting and meaningful impact on Tanzania's agricultural sector.

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APPENDICES

Appendix I: Farmers Interview

My name is ERASTO GOWELLE, a postgraduate student with registration number 20169192 at Open University of Tanzania. I am pursuing masters of international cooperations and development. To accomplish my masters in stated course requires me to conduct research related to the course. Therefore, I intended to understand in detail the contribution of foreign aid on development of Dakawa Irrigation Scheme in Morogoro, Tanzania. Thus, you are kindly requested to participate in this interview by providing information to the questions in this questionnaire. I would like to assure you that the information in this questionnaire will be secret and used only for the intended research purpose. I thank you in advance for all your cooperation and ask for your participation consent.

1. Village name
2. Sex of respondent a) Male b) Female
3. Age of respondent.....
4. Family size.....
5. Marital status a) Married b) Not married
6. Education
 - a) None
 - b) Primary school
 - c) Secondary school
 - d) College (Certificate, Diploma)
 - e) University

7. How is the condition and performance of irrigation infrastructure after foreign aid intervention?

Scores: a) Very good b) Good c) Fair d) Poor

No	Irrigation scheme infrastructure	Score
8. I	Intake structure or storage facility (Pond)	
II	Water pump	
III	Main canal	
IV	Secondary canals	
V	Canal gates	
VI	Field channels	
VII	Field level	
VIII	Drainage system	
IX	On-farm access roads	

irrigation management system perform its roles after the foreign aid intervention in the scheme? (Choose the most correct option).

No	Performance of the management system	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
i	Farmers get water at right time					
ii	Land is allocated fairly					
iii	Infrastructure are maintained and rehabilitated according to the maintenance					

	schedule					
iv	Promote good farming practice (Training farmers, using hybrid seed and transplanting method during paddy planting)					
v	Leaders attend training to improve their skills					

9. How international donors do improve the capacity of farmers in carrying out their activities?

No	Farmer capacitation	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
i	Arrange training and capacity building programme on good farming practice					
ii	Grand access of loan to farmers					
iii	Grand access of agricultural inputs					

10. Which mode of training international donor use to capacitate farmers?

- a) Practical training at the scheme
- b) Theoretical training in classroom
- c) Study tours
- d) Any other mode (Specify).....

ii.(Multiple response allowed)

Appendix II: Questionnaires for Famers of Dakawa Irrigators Cooperative Union

My name is ERASTO GOWELLE, a postgraduate student with registration number Pg20169192 at Open University of Tanzania. I am pursuing masters of international cooperations and development. To accomplish my masters in stated course requires me to conduct a research related to the course. Therefore, I intended to understand in detail the contribution of foreign aid on development of Dakawa Irrigation Scheme in Morogoro, Tanzania. I would therefore like to request your participation in the study. The information you provide in this questionnaire will be used for purposes of my Masters study and will be preserved with the utmost confidentiality. May I ask you to be honest and please do not write your name anywhere in this questionnaire.

Tool 1: questionnaire

SECTION A: Demographic information

1. Gender: Female Male
2. Village name
3. Age of respondent.....
4. Marital status
 - a) Married
 - b) Not married
 - c) Divorce
5. Education level (Please check)

- a) Not attended
- b) Primary
- c) Secondary
- d) College (Certificate, Diploma)
- e) University

SECTION B:

- 6. How much fund does your scheme receive from donors?
- 7. For how long does your scheme been receiving fund from donors?
- 8. When was the last time your scheme received fund from donors?
- 9. How much fund does your scheme receive from the government?
- 10. Are there any special conditions attached to fund use? YES/NO
- 11. If yes, are the conditions attached to the following aspects? Please check.
 - a) Development of irrigation schemes infrastructure
 - b) Capacity building to farmers
 - c) Strengthening scheme management systems
- 12. Mention other aspects if any

iii.....

13. If no conditions attached, does your scheme plans consider the following aspects?

a) Improving agricultural inputs

b) Construction of water reservoir

c) Water use efficiency

14. Apart from donors and government support what are the other sources of fund does your scheme receive?

iv.....

15. Do you receive any other support from the government apart from funds?

Please check.

a) Government

b) Civil Social Organizations

c) Private companies

d) Membership collections

e) Any other individual farmers

SECTION C

16. Scheme Infrastructure Maintenance and Rehabilitation

v. Please rate the extent to which the following statement indicates the level of agreement using the following scale 1= Very good, 2= Good, 3= Fair, 4= Poor.

17. To what extent has foreign aid improved the following aspects of the scheme?

Irrigation scheme infrastructure	Scale			
	1	2	3	4
	Very good	Good	Fair	Poor
Intake structure or storage facility (pond)				
Water pump				
Main canal				
Secondary canals				
Canal gates				
Field channels				
On-farm access roads				

18. Management Systems

Please rate the extent to which the following statement indicates the level of agreement on irrigation management system perform its roles after the foreign aid

intervention in the scheme using the following scale, 1 -Strongly Agree, 2-Agree, 3 Undecided, 4 Disagree 5- strongly disagree.

No	Performance of the management system	Scale				
		1	2	3	4	5
		Strongly agree	Agree	Undecided	Disagree	Strongly disagree
	Farmers get water throughout the year					
	Land is fairly allocated and utilized efficiently.					
	Infrastructure are maintained and					
	rehabilitated according to the maintenance schedule					
	Promote good farming practices that support sustainable agriculture as a way of dealing with climate change.					
	Leaders attend training to improve their skills					
	Farmers attend training to improve their skills					

19. Farmer's Capacitation

i. Please rate the extent to which the following statements indicate the level of agreement on the following. 1. Strongly Agree 2. Agree, 3. Neutral 4. Disagree 5. Strongly disagree

ii. To what extent has foreign aid improved farmers' skills and knowhow in the following areas?

iii.

No	Farmer capacitation	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
i.	Farming technology					
ii.	Access to financial opportunities					
iii.	Access and use of agricultural inputs					

APPENDIX III: INTERVIEW FOR DAKAWA IRRIGATION SCHEME BOARD MEMBER

My name is ERASTO GOWELLE, a postgraduate student with registration number Pg 20169192 at Open University of Tanzania. I am pursuing masters of international Cooperations and development. To accomplish my masters in stated course requires me to conduct a research related to the course. Therefore, I intended to understand in detail the contribution of foreign aid on development of Dakawa Irrigation Scheme in Morogoro, Tanzania. I would therefore like to request your participation in the study. I would therefore like to request your participation in the study. The information you provide in this interview will not be used for purposes other than my Masters study and will be treated with greatest confidentiality.

Tool 2: Interview

1. How have capacity building programmes resulting from foreign aid provided farmers with sustainable agriculture practices as a way of dealing deal with climate changes?
2. How has foreign aid helped optimal use of scheme inputs?
3. How has foreign aid helped to develop technical knowhow to maintain and rehabilitate scheme facilities?

**APPENDIX III: COMPARISON OF THE LAND SIZE CULTIVATED
BEFORE AND AFTER FOREIGN AID SUPPORT**

Variable	Paired Differences					t	df	Sig. (2- tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
The size of land cultivated before and after the foreign aid support	.267	2.243	.409	-.571	1.104	.651	29	.520

**APPENDIX IV: NUMBER OF BAGS(7TINS) PRODUCED BEFORE AND
AFTER FOREIGN AIDS SUPPORT**

Variable	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of t				
				Lower	Upper			
Number of bags (7tins) produced before after the foreign aid support.	-.967	1.847	.337	-1.656	-.277	-2.866	29	.008