BUSITEMA UNIVERSITY
FACULTY OF SCIENCE AND EDUCATION

DEPARTMENT OF GEOGRAPHY.

EFFECTS OF IRRIGATION AGRICULITURE TO THE SOCIAL ECONOMIC DEVELOPMENT OF MWELO PARISH IN MULANDA SUBCOUNTY IN TORORO DISTRICT IN EASTERN UGANDA

BY

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JULY 2023

STATEMENT OF DECLARATION

I OFWONO KENETH, declare that this research proposal is my original work and has not been published or submitted for any other degree award to any other university

Student signature .....**Date**.....12th/12/2023

.OFWONO KENETH

APPROVAL

This is to certify that this research work is for OFWONO KENETH, entitled the "effects of irrigation agriculture to the social economic development of mwelo Sub County in Tororo district" and has been under my supervision and is now ready to be submitted to the department of geography with my approval.

Supervisors signature..... Date.....13/12/23

DR. TURYAHABWE REMIGIO

DEDICATIONS

This research is dedicated to my beloved brothers, ODOI DANIEL, AND OWOR DAUSON together with my sister FLORENCE ABBO for their financial support that they offered to me and for their morale boosting efforts they offered during this research, and for their regular prayers during my academic struggle throughout the years till the completion of my studies,

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LIST OF ABBREVIATIONS

GDP: Gross Domestic Product.

SED: Social Economic Development.

IR: Irrigation Agriculture.

HDI: Human Development Index.

FDI: Foreign Direct Investment.

WUA: Water Users Association.

IWRM: Integrated Water Resource Management.

BDC: Basic Development Corridor.

ICT: Information and Communication Technology.

NRM: Natural Resource Management.

WE: World Economic Forum.

EWS: Early Warning Systems.

APR: Annual Progress Report.

PPP: Public Private Partnership.

SME: Small and Medium Enterprises.

O&M: Operation and Maintenance.

IEC: Information, Equation and Communication.

CSR: Corporate Social Responsibility.

NGOs: Non-Government Organizations

DTM: Database Tracking Matrix.

ABSTRACT

The study examines the effects of irrigation agriculture to the social economic development of mwelo parish in mulanda district in Tororo district.104 respondents were selected from villages of mwelo, mikiya Amor, kandi, kisote, Rucwa including the village chairpersons, councilors, the respondents were selected using simple random sampling and sampling procedures. Objective and structured questionnaires, interviews, observation, recording and cameras were the tools used during data collection. the objectives of study were four which included, (1) positive effects of irrigation agriculture to the social economic development of mwelo parish in mulanda sub county. (2) negative effects of irrigation agriculture to the social economic development of mwelo in mulanda sub county. (3) the mitigation measures to the negative effects of irrigation agriculture on the social economic development of mwelo in mulanda. The results reveal that the positive effects of irrigation agriculture on the social economic development of mwelo includes; source of food, source of income, source of employment, development of trading centers, establishment of roads, relationship with neighbors, recreation center. negative effects of irrigation agriculture include; soil infertility, increase in prices of commodities, competition with the out growers, increased expenditure, land occupation, crime rates, accidents, pollution, famine, thefts, low productivity, floods. Mitigation measures to the negative effects of irrigation agriculture includes; fertilizer application, spraying in the morning and evening, security guard, security council, water channel, restriction to water uses, police post, sensitization of masses, out growing of other crops, crop rotation, discount for land, improved seeds, employing of local security, proper disposal of waste. according to the findings of report, it was recommended that the it should be acquisition of more land for the scheme, improvement of police post to police station to solve far better the problems resulting from irrigation agriculture.

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CHAPTER ONE: INTRODUCTION

The chapter will contain the introductory item of the research including the background of the study, problem statement, and the purpose of the study, the research objectives, the research questions, the research hypothesis, and the significance of the study, the definition of the key terms, the scope of the study, limitations and delimitations of the study.

1.1 BACKGROUND OF THE STUDY

According to Motswana et al (2006), irrigation refers to the ministering of land through the artificial application of water to ensure double cropping as well as the steady supply of water in areas where rainfall is unreliable

According to tony ware (January 2021), irrigation refers to the practice of artificially providing water for the land to help plants, crops and grass ground.

Irrigation therefore can be defined as the process of supplementing the rain water through the artificial supply of water to the crops. This is done to ensure that there is continues supply of food even when the natural climate of an area could try to hinder such activities.

According to cantor (1967) irrigation enterprises are associated from early historical times with every civilized society. The first irrigation took place in Mesopotamia and other areas of the old world and the type of irrigation which took place in this early times was primarily known as river flooding which would cover the low lands of the delta. The flood waters would prepare the soil for the forthcoming agricultural time and would provide the early agricultural people with new layers of fertile and productive silt. A good crop could be grown with a minimum of expertise on the part of the early agrion people. According to john smith (2023), Gezira scheme is one of the biggest irrigation schemes in the world

According to p. Wolff and wellbender (1994) the irrigate on of arable land and pastures has been practiced around the world for thousands of years and with the aid of irrigation it was and still possible to grow crops with reliably high yields in all arid regions of the earth.at the same time, irrigation hasallowed increased and adequate supply of food production. Without that, it would not have been possible for sophisticated civilization to develop along the Nile (Egypt), the Tigris and Euphrates (turkey, Syria and Iraq), the Nidus (Pakistan and India), the Ganges (India and Bangladesh) and also along the yellow river in china.

It is approximated that around 1800 about 8 million hectares of land were being irrigated around the world but in 100 years later the figure had increased to about 40 million hectares partly as a result of modern sprinkler irrigation available food production to gardeners and farmers. During green revolution, the rate of irrigation increased and this enabled around 36 percent of the world’s food production.

According to YUDDELMAN (1994), on a regional basis, it is estimated that around 60 % of the value of food production in Asia is grown on irrigated land. and this includes about 80% of the Pakistan's food production, 70 percent of Chinas food and over 50% of the food produced in India and Indonesia, in the middle East and in North Africa, around one third of the food produced is got through irrigation including the food grown in Egypt, Iraq and Iran and relatively small portion of food produced in Latin America

According to Intisar Hussain and MahdidunBhatpara, irrigated agriculture had increased enormously over the past seven decades resulting from a revolution in irrigation development which had increased from less than 100 ha in 1950 to more than 275 million ha in 2000 and most of the expansion in irrigation was taking place in the developing countries. They added that out of the total irrigated crop land, nearly 100 million ha was in china and India.

According to Rose grant (1995), new sources of water are increasingly expensive to exploit limiting the potential for expansion in new water supplies. if we look at the situation in India, Indonesia, Philippians, sir lanker and Thailand we find that the real cost for putting up a new irrigation system on an unweighted average increased from us dollars 1.744 per hectare in 1964 to 69 up to us dollars 4.385 per hectare in 1986-88.

According to (Bjorn Lund et al., 2020), formal irrigation schemes took some good period to reach Africa for example it was introduced in the sub Saharan Africa by the colonial governments in disregards of local social- economic and biophysical context as it was intended to meet of export crop production and this continued even after the independence in sub Saharan Africa although it was not funded by the farmers themselves but by some donors.

As stated by (Muter and Leutze, 2005), the term "government scheme "refers to the schemes which are set up and it is under the control of the government, however it is known that the government control over irrigation schemes varies from countries to countries and this depends on the type and the size of the scheme, but all in all, it has been established that government schemes do not do well fora good number of years and they are the schemes mainly set up in the sub Saharan Africa.

According to (Todaro 2012), the rain fed agriculture has led to low production of food in the sub-Saharan Africa this is because it is unreliable to many areas and he also added that this is mainly caused by the changing weather condition of the places which results into the negative effects of the climatic change.

Nxumalo and Oladele (2013), stated that empowerment and participation are the two most important issues in agricultural development programs as participation is so vital in coming up with successful and acceptable programs due to the fact that they speed up developmental plans.

Since the government could not manage to set up powerful irrigation projects, it encouraged the community members to participate in small scale irrigation projects but still people could not participate in this kind of the project and this is believed to have been caused by the inability of some of these projects to meet the production needs of the farmers (Marty et al 2013).

According to United Nations (2013), the global population is estimated to increase up to around 9.6 billion people by 050 and these will demand an increase in food production, therefore, this can be enhanced with an increase in irrigation level.

According to (FAO, 2000), basing on the fact that lack of water storage and temporal variations in rainfall .it has caused the problem of most farmers not producing more than one crop per year. This is attributed to in adequacy of rainfall, variability in the timing of its start and ending or the occurrence of dry spells during dry seasons.

According to FAO (2005), around 162 dams had been constructed in sub-Saharan Africa by 1990 which could enable the irrigation of about 725 hectares of land if made, alternatively by around 1992, more than 80, 000 pumps had been distributed and each pump was estimated to irrigate 0.5 to 1.0 hectares of land.

Irrigation continued to be extended to Africa and this was to boost the production of both commercial and substantial agriculture and this led to many irrigation schemes being set up in Africa such as the Kano river project of 1970.

According to Kadzombe et al (1973), large scale irrigation schemes comparatively are more profitable and has social economic advantages than small scale ones mean while chenje et al (1998), says that to empower the communal members, it is better to practice small-scale irrigation because it can fever the small land available in the community.

According to (FAO, 1997), In Democratic Republic of Congo, about 10,000 hectares of land could be developed for irrigation. This is because the area is hilly and due to the fact that it is not easy to set up irrigation scheme in hilly areas because of the difficulties in transportation of the materials needed and it is estimated that about only 1% of the land is covered by Nile basin.

In Uganda, irrigation has been practiced mostly in areas around river Nile since it is clear that irrigation needs a source of water however, it is seen that irrigation has not been a serious deal in Uganda at large this is because of the favorable climatic conditions in most parts of the country and is has been confirmed that about 80% of the irrigated land gets water from Victoria Nile.

According to Nile basin water resource (NBWRA), (2016-2023), it is believed that most crops grown in the irrigated land of Uganda are; sugarcane, rice and vegetables of which the total estimated water annual demand is 260 MCM. It also adds to say that irrigation is a relatively new as rainfall has been more or less sufficient in the past as most of the countries parts are experiencing at least one long rainy seasons and this has been sufficient for farmers to produce at least one crop a year.

Due to the fact that Uganda is still a low developed country, it is still lugged behind in terms of growing crops like rice and vegetables, however to some extent due to the foreign investors, large estates grow crops like rice and sugarcane.

Because of the low development of the country, the main form of irrigation which has been in place is the surface irrigation much as there was introduction of greenhouse irrigated flower that started to use the drip and micro sprinkler that was in 1990.

According to (PPU 2022) Kenya, the EAC had a meeting to set up an irrigation scheme in Tororo the border of Uganda and Kenya, the meeting was held in Arusha in Tanzania when president Uhuru was handing over the power, the project was said to irrigate about 3300 hectares of land

On 4th of July 2023, the government together with the ministry of water and environment had a meeting to discuss about the handover of the site for the construction of an irrigation scheme in Gule in Tororo district, the irrigation system will be powered by solar system and it is estimated to take around Shs716 million and it is to be constructed by Nexus limited.

According to the current plan of the ministry of water and environment, around 687 irrigation systems are to be constructed in Uganda and Tororo has got the opportunity to get two being constructed in the year 2023 that is Gule and Amagoro irrigation sites. The projects are to help the surrounding people to boost their economic status as well as food production as the targeted money for the parish development model (PDM) is expected to help the rural farmers of these villages to curry out activities such as aiding vegetable growing using the scheme, the people of Tororo especially in the areas where the project is to be put are urged to embrace the program and extend their support to the constructors during the construction of the irrigation schemes. (Okeya) the chairperson local council 5 Tororo district.

Because of the climatic change which is experienced in Tororo and Uganda at large which has brought about shortage of rainfall in the current time, people are now practicing irrigation although in small scale as many people now use watering can to water their crops such as

tomatoes, rice and so on however this has been on small scale because of the shortage of knowledge and this needs to be solved by training farmers on how to do irrigation however, according to Nile basin water resources atlas, an irrigation policy has been set up to work on such issues. It is upon the above back ground that there is a need to assess the effects of irrigation agriculture to the social economic development of Mwelo Sub County in Tororo district.

1.2 PROBLEM STATEMENT

In spite of the fact that the irrigation scheme of mwelo was set up to boost the production of food and also to influence people's lives both socially and economically, it remains a pressing issue as social and economic problems continue to affect the community members in a way that the community members continue to suffer from the problems of shortage of food and this has made the irrigation scheme un realistic making its target failed to be realized. However, an assessment needs to be carried out on how the scheme has affected the social economic development of mwelo parish in mulanda district in Tororo district.

1.3 GENERAL OBJECTIVE OF THE STUDY

The study will focus on establishing the effects of the irrigation scheme on the social economic development of mwelo Sub County in Tororo district.

1.4 RESEACH OBJECTIVES

To establish the negative effects of the irrigation agriculture on the social economic development of mwelo sub county in Tororo.

To find out the positive effects of the irrigation agriculture on the social economic development of mwelo sub county in Tororo district.

To establish some mitigation measures to be taken to solve the negative effects of irrigation agriculture on the social economic development of mwelo sub county in Tororo district.

1.5 RESEARCH QUESTIONS

What are the challenges facing the people of mwelo sub county as a result of the irrigation agriculture?

How has the establishment of irrigation scheme in mwelo contributed positively on the development?

What are the possible solutions to the negative effects of the irrigation agriculture in mwelo Sub County in Tororo district?

1.6 SIGNIFCANCY OF THE STUDY

Study will lead to the award of a bachelor's degree of science and education in Busitema University.

The study will also prove to the people of mwelo that much as they are undermining the project claiming that it is UN productive, it has got some influence on the social economic development mwelo.

The paper will also remind the government about the problems faced by people of mwelo such that it can plan accordingly.

1.7 SCOPE OF THE STUDY

The study will focus on main negative effects of irrigation agriculture on the social economic development of mwelo sub county, the positive effects of the irrigation scheme as well as the mitigation measures to be taken to solve negative effects of the scheme to the social economic development of mwelo sub county. the study will be carried out in about 6 villages of Rucwa, mikiya, Amor, kisote, kandi and parachami.

1.8 BACKGROUND OF THE STUDY AREA

1.8.1 PHYSICAL LOCATION

Mwelo sub country is found in west Budama south constituency in Tororo district in eastern region of Uganda. It is located about 170 km east of Kampala. It has a rounded elevation of limited extend rising above the surrounding land with local relief of less than 300m, it is located at latitude 0 42 33" N and longitude 34 3 32" E , it experiences tropical monsoon climate, it is neighboring places such as kisote, abwel, mulanda, Nagongera, pajwenda, morikiswa and so on.

1.8.2 A MAP OF UGANDA SHOWING THE PHYSICAL LOCATION OF TORORO DISTRICT.

1.8.3 A MAP OF TORORO SHOWING THE LOCATION OF MULANDA SUBCOUNTY

1.8.4 RELIEF AND DRAINAGE

Mwelo sub county is an island because it is surrounded by swamps such as kisote swamp which has got some papyrus vegetation although in small quantity, it is also surrounded by were swamp in the northern part of it, however it is also neighboring odoponyi water streme from the northern part of it which has facilitated the growth of rice as well as providing fish for the surrounding people hence supplementing the diet.

1.8.5 CLIMATE, VEGETATION AND SOILS

Mwelo sub county experiences monsoon type of climate characterized by average amount of rain fall of about 298.8 mm of precipitation and has 303.37 rainy days of the time annually. The temperature is always about 23.0 degrees centigrade, it has got savannah type of vegetation characterized by grassland as well as the tree vegetation which dominates most of the area, it has got loam soil in some places such as kandi village, sand soil in parachami village as well as some clay most especially in the swamps of parachami neighboring abwel.

1.8.6 THE SOCIAL ECONOMIC BACKGROUND

Mwelo has got 6 villages of mikiya Amor, kisote, agumit, kandi, mwelo, and mikiya main and has got about 3000 households according to the current registration for the distribution of nets. Most of the people in mwelo survive on agriculture that is through growing of crops as well as rearing of animals, crops grown are mainly cassava and rice although they also grow gnats. Its these crops that they sale and get money for other things, some people also carry out sand mining

most especially along kisoko kisote land, to some extend they also practiced small scale fishing in the water stream of kisote along mulanda –nagongera road.

1.9 LIMITATIONS OF THE STUDY

There may be a denial of some important information by the respondents as many of them may be illiterate and therefore may not know the reason for them to release some information to the researcher.

The researcher is also most likely to face the problem of limited time since the study areas are many and it's not easy to investigate and get the information there and then.

The researcher may also face the challenge of limited funds to fund the activities such as transport fare, moral boosting the respondents since the study will need them to pause what they are doing and respond.

The researcher is also most likely to face the problem of language barrier since these places are not occupied by only one tribe.

The researcher may also face a challenge of long distance since the area to carry out the research from is too big and this can lead to fatigue hence fake result.

1.10 DELIMITATIONS

The researcher should move with a well-known person in the area as well as the letter from the head of authority such as LC 1 such that the respondents don't get scared of giving him the clear information.

The researcher should start the study processes as early as possible by sending the question early such that the respondents can have enough time to respond.

The researcher should gather some funds as early as possible and also minimize the way of spending it such that it can be enough for him to complete the study.

The researcher can move in some few places then the rest of the places can be studied through sending a questionnaire to avoid over movement.

Literate people mainly can be given the opportunity to answer the questionnaire since the questionnaire will be in English to avoid the problem of language barrier.

CHAPTER TWO: LITERATURE REVIEW.

This chapter is to survey the literature which speaks the key concepts related to the dominant effects of irrigation agriculture, the negative effects of irrigation agriculture, the positive effects of irrigation agriculture as well as the mitigation measures to the negative effects of irrigation agriculture on the social economic development

2.1 POSITIVE EFFECTS OF IRRIGATION AGRICULTURE.

It should be noted that many people survive on agriculture globally, and therefore people could suffer due to the increased climatic changes caused by human activities such as deforestation, industrialization and so on, but because of the introduction of irrigation agriculture, the job has been secured for all as people can now grow their crops without following the season. As stated by Dhawan and Datta, (1992), observed that irrigation has stability effects because of reduced reliance on rainfall. he further noted that irrigation agriculture plays an important role in lowering the variance of output and employment. The irrigators employ non irrigators in different sites for example as security guards to guard the farm during night hours as some encroachers can enter into the farm and steal some of the materials used in the farm such as the pipes, crops and so on including clearance of the land, harvesting and other things, because of the employment people get as a result of irrigation, poverty is being seen reduced as many people are opening shops, bakeries and so on.

Concerning poverty reduction, irrigation has played a vital role. As stated by Hossain and Hanjra (2004), that irrigation development could lead to new opportunities in agricultural trading. this results into increased wealth by many people making goods and services more demanded and as they get more demanded, it calls for investors to come to such areas to put up their investments as they are sure of the market for their goods, for example the increased investments in Kibimba are as a result of the irrigation agriculture there. Apart from that, the food to feed the investors most especially the domestic investors are got from the irrigation agriculture moreover at a cheap price. It should also be noted that irrigation leads to increased infrastructural development for example by roads as this is constructed to ease the transportation of crops from the irrigated sites to the market place and stores. Melvyn, (2003), said that irrigation has got numerous potential benefits in Africa, it boosts food production building food security in most of African countries.

Irrigation agriculture has also affected people positively in a way that it has led to improvement in the quality of life ,basing on the human development index which was developed by Alkire and Eli, (2010),the quality of life as accomplished through increased revenue and improved nutrition which all are as a result of irrigation , the study also noted that 100% of the irrigators homes had access to tapped water and about only 80% of the non-irrigators homes had access to clean water, this clearly shows that irrigation has hot significant impact as far as the improvement in the standard of living is concerned .Brooks, Adger et al also noted that one of the benefits of irrigation is that they led to asset accumulation which led to poverty reduction and wealth accumulation . the study also showed that about 75% of the irrigators homes has got access to cooking stoves, paraffin as well as electricity as a means for cooking while only 5 % of the homes belonging to the dryland farmers have access to electricity and majority of the people use firewood as the means of cooking. It was also noted that the homes of irrigators have got radio sets, about two mobile phones and so on as compared to the homes of the dryland farmers.

Irrigation agriculture has also played a vital role in ensuring that farmers income gets increased , according to the Zimbabwe's rural irrigation, it was established that the income gained by the irrigators is substantially higher than the wages of the other farm employees and other primary economic sectors for example farm laborers earned between US$30 and US$45 per month while other staffs working in other areas of the economy earned average salary of about $130 per month, another advantage of the farmers who practice irrigation is that most of the irrigation schemes are found in rural areas and so their income cannot be spent to the level of other officers who live in town that they need to pay money for rentals, buying things expensively and so on. With the above, we can therefore end by saying that irrigation has played a very important role as far as the farmers income is concerned.

2.2 **NEGATIVE EFFECTS OF IRRIGATION AGRICULTURE.**

Much as irrigation is considered important in many aspects, we can't fail to identify some of the challenges that it has, and with that, we have confirmed that irrigation involves increased cost of operation in a way that most of the things used in the farm is brought by money, for example buying machines for harvesting and ploughing the garden, paying the workers such as the security guards as well as the ones who help in clearing of the gardens. According to Bos et al (2005), the ratio of irrigation cost to total cost for surface irrigation in healthy systems should be between 3-4% and should be lower than 10% in ground water irrigated area, it should be noted that as the cost of irrigation activities increase to that rate, farmers will be only working for survival but not to get rich and this will make most of the people who could admire to participate in irrigation agriculture to loose moral making irrigation a redundant field and activity.

According to Bayabil et al(2020), another effects of irrigation is the pollution of fresh water , he said that can be caused by improper irrigation activity for example if the pipes are cracked ,

Bayabil continued to say that it can also result into public health risks and this is worst when the irrigation is used also for fertilizers application as well as other chemicals in addition to the irrigation work, this can be worsened if the source of water for irrigation is also used for drinking purposes , even when the ,irrigation is not used for supplying chemicals still the backflow of water to the source can lead to water contamination and this has led to many people getting water contaminated diseases such as cholera, typhoid and so on making some members of the community who cannot treat the water before use to hate the project of irrigation claiming that it is a danger to their lives.

Irrigation agriculture leads to decrease in underground water table which would help the crops to grow in a normal way. Now the question is 'if the source of water for irrigation dries up that irrigation agriculture cannot continue anymore, what will be used for continuous supply of food to the growing population'. Jan Carruthers, an internationally recognized well known agricultural economist formerly at wye college, university of London, forecasts a switch in a global production base which will lead to the cities of the south (developing countries). producing bulk of the manufactured goods and services such a banking, insurance and so on while northern (developed countries) producing the bulk of their food, the local food supply will not be enough to supply the southern countries due to the increased population, it is believed that the yields of food which used to be got during green revolution can never be got , this is because the technology and the maintain ace which used to be put is no longer there, this maintenance activities could involve use of fertilizers such as nitrogen fertilizers etc. the study also says that public and private agricultural research in both the north and the south will continue to receive diminishing resources and new biotechnologies appears to stumble along with only few practical innovations facing growing consumer resistance however still Jan Carruthers, had an opinion that the prospects for the second face of green revolution I remote, he is convinced That the tropical and subtropical developing world will in about 20 year time produce a bulk of the manufactured goods and the temperate world will produce bulk of the food (Caruthers and Morrison) 1994.

Irrigation has been seen also leading to massive subsides and distorting incentives. According to Rose grant (1995), most of the world does not treat water as a scarce resource despite the challenges. both urban and rural water users are provided with the massive subsides on water use. it goes ahead to say that irrigation water is essentially un priced. in urban areas, the price of water does not cover the cost of delivery. The study says that the decision in the capital investment in water sector are carried out irrespective of the management of the resource. (Rosegrant, Yadav et al (1995), said that annual irrigation subsides are estimated at US$0.6 billion in Pakistan, US$ 1.2 billion in India, US$ 5.0 billion in Egypt. It is also known that in areas and countries where water is got for free, people do not take care including the leaders, managers and so on making the water to be wasted for all sorts of purposes including nonprofit able, this has made water unreliable and also it has led to backflow of water into the water source where it can carry with it some chemicals as well leading to detoriation of water source

According to FAO (1995), half of the irrigated land is threatened by the three silent enemies of waterlogging, alkalanisation and salinization. This has resulted into the degradation of the

irrigated cropland. According to Rosegrant (1995), for the last a, it has been a significant degradation of the existing irrigation cropland, it was estimated that the global losses of the agricultural land as a result of waterlogging and alkalanisation ranges between 160000 to 300000 hectares. Ashtyn (1991), came up with a conclusion that salinity seriously reduces production in about 20 to 30 hectares of the irrigated land. However, it should be noted that not only salinity, waterlogging that leads to degradation of irrigation cropland but also, factors such as siltation, degradation of the watershed and so on.

2.3 **SOLUTIONS TO THE NEGATIVE EFFECTS OF IRRIGATION AGRICULTURE**.

According to Postel, (1999) irrigation activities has been practiced worldwide for more than 6000 years. This has led to increased technology to be used in irrigation most especially in Africa during the past decades, irrigation was poorly done but when the investors came in, it was realized that technology started to be injected in the irrigation sites. the technology included the diversion work, pumping, filtration, conveyance, distribution, application methods, its known that initially irrigation was done by use of gravity to supply water but due to the technology, we now see both manually and mechanical sprinkler machines used. And this has reduced the low quality yields as well as water detoriation which could result from the poor method of irrigation.

Supplemental irrigation has been used to supplement the rain fade agriculture, it had been a challenge that as irrigation leads to decrease in underground water table, it would later alone lead to stopping of crop production especially during dry season but due to the fact that almost all the definition of irrigation talks about the supplement of rain fade agriculture. the deal is targeted to mainly arid and semi-arid region where it may be possible to irrigate the land at least wo seasons a year. According to Sojka et al, (1981), Zhang and Oweis (1999) this is a form of managed deficit irrigation where the impacts of the timing and applications of limited water supplies relative to only rain fade agriculture can be very positive. It is believed that these techniques work in suppling water to crops in different stages which are crucial for example during planting season where there is no rain to help in the germination etc. And this will make crops to be planted and harvested in any month of the year.

According to the American scientific research journal for engineering and technology (2019), the primary means of improving food crop production will be affected by extending and upgrading irrigation systems. The study continued to say that to eliminate poverty in Saedawgyi irrigated area, improved technical, engineering, extension support, changes to crop selection and so on has been practiced. The study confirmed that the area was experiencing a long dry season and infertile sandy soil, poor drainage as well as soil erosion and yet agriculture was a source of livelihood for about 70% of the population in the area. Therefore, it can be concluded that mostly it’s because of poor irrigation method or techniques that it results into negative effects of irrigation agriculture to the social economic development of a given area and that is why

irrigation schemes which are found in rural areas where much enfaces is not put by the government to improve, for example that of morikiswa in Tororo district always result into negative effects hence being abandoned.

According to the study carried out by Evans and Sadler in increasing water efficiency, regulated deficit irrigation has been one of the ways to improve irrigation and so to solve the negative effects which could result from irrigation if attention had not been given to it, Fereres and Soriano, (2006), said that to date, regulated deficit irrigation has been investigated mainly on perennial crops but some annual crops should also benefit. He continues to say that RDI has been tested in many tree crops and grapes with generally good results. According to Drake and Evans, all these crops have been produced particularly with respect to product quality.it should be known that RDI is targeted in minimizing vegetative production, improving the quality of fruits and also to make it mature at a faster rate. The beneficial responses to RDI has been shown by the research in Australia in peaches (Chalmers et al 1981) and pears (Mitchell et al 1984) as well as in Washington in apples (Proebesting et al 1977) and according to Evans (1997), RDI should be done both for irrigation water as well as the rain water. Therefore it can be concluded that Regulated Deficit Irrigation has played a great role in wiping tears most especially farmers who are crying with the negative effects of irrigation agriculture as now crops such as fruits can do well moreover within the shortest period making it easy for them to get money for educating their children, pay rentals in time and afford their daily needs without much struggle, however this technique is not reliable to all the irrigated farmers most especially the ones of the villages.

CHAPTER THREE: RESEACH METHODOLOGY.

3.0 INTRODUCTION

This chapter is all about the possible procedures which will be followed to collect data during research study.

It will focus on the research design, sample size, sampling procedures, methods of data collection both primary and secondary, interview, recording, observation, simple random sampling techniques, purposive sampling technique, convenience sampling, (nonprobability), data analysis and presentation as well as ethical considerations.

3.1 RESEARCH DESIGN

The researcher will employ both primary and secondary method of data collection. there will be both qualitative and quantitative designs. These techniques shall be used by the researcher to obtain data concerning the research problem which is the effects of irrigation agriculture on the social economic development of mwelo in mulanda sub country Tororo district.

3.2 SAMPLING PROCEDURE

Sampling procedures involving a combination of purposive and random sampling procedures will be used to obtain a representative sample of the households.

The first step will involve the purposive selection of the sub county where irrigation agriculture is more serious and draw a conclusion on the effects of irrigation agriculture and some of the mitigation measures that has been tried to solve the negative effects of irrigation agriculture, the second step will involve random selection of parishes and the last stage will involve simple random sampling of households from the selected sub county of mulanda. the list of names of the selected households shall be obtained from the local council chairpersons of the selected villages.

3.3 SIMPLE RANDOM SAMPLING TECHNIQUE

In this method of random sampling, all individuals or households in the population will have equal chances of being selected to represent the population to respond to the researcher. This will be done depending on the parishes in the sub county especially those ones surrounding the irrigation scheme of mwelo which experience more effects of the scheme, they include; kandi, Rucwa, Amor, mikiya, parachami, kisote and so on.

3.4 CONVINIENCE SAMPLING.

Here the researcher will go to areas around the irrigation scheme and land on a household affected by the irrigation from here serious discussion will be made accordingly. The researcher will ask the respondent some of the effects they experience as a result of irrigation scheme.

3.5 INTERVIEW.

Using interview method, the researcher will meet some individuals which will be selected at random from the villages which experience the effects of irrigation agriculture and discuss with them the research problem, the dominant negative effects of irrigation agriculture, the positive effects of irrigation agriculture, and some of the mitigation measures that have been put in place to solve the negative effects of irrigation agriculture.

3.6 RECORDING

this method will involve the researcher to take some photographs especially on how the peoples life style as well as the development of the area has been as a result of irrigation agriculture, it will also involve the researcher to record the audio of the respondents for example as they give some of the challenges they face as a result of irrigation agriculture.

3.7 OBSERVATION

In this method, the researcher will use his naked eyes to see some of the positive effects of irrigation agriculture and measures being taken to solve the negative effects of irrigation agriculture.

3.8 QUESTIONNAIRES

This method will involve the use of a number of questions typed and printed in a definite order on a form or asset of forms. therefore, the researcher will design questionnaires for concerned respondents in simple language will be understood in order to obtain accurate and consistent answers from the respondents. The researcher will administer the questionnaires to the sub county officers, parish councilors, parish and village chairpersons of the area of concern. The questionnaires will consist of dichotomous questions (yes or no answers), multiple choice questions as well as open ended questions which will contain all the necessary information concerning irrigation agriculture in mwelo.

3.9 DATA ANALYSIS AND INTERPRETATION

In this section the researcher will present different approaches that will be used to analyze data according to the set objectives of the study and the information will be obtained from respondents which will be tabulated and represented on the graph.

3.10 ETHICAL CONSIDERATIONS

The researcher will assure the respondents of informed research, confidentiality of the information provided; non traceability, research objectives and the researcher informed the respondents of the reason for the activity in obtaining true information from the respondents.

CHAPTER FOUR: DATA PRESENTATION, INTERPRETATION ANALYSIS OF RESULTS.

4.0 Introduction

This chapter contains detailed presentation and discussion of data analysis and the results of this study. the findings are presented under the following headings. Positive effects of irrigation agriculture to the social economic development of mwelo sub country, negative effects f irrigation agriculture to the social economic development of mwelo sub country, mitigation measures to be adopted in order to solve the negative effects of irrigation agriculture on t5hye social eco0nomic development of mwelo sub country in Tororo district.

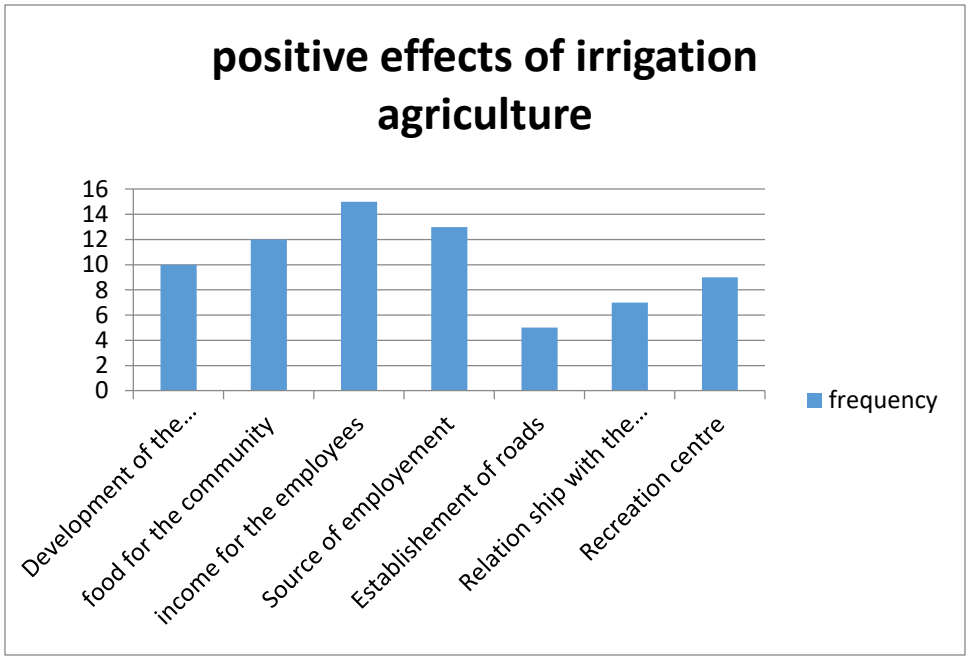
4.1 Positive effects of irrigation agriculture on the social economic development of mwelo sub county in Tororo district.

Research portrays that there are many positive effects of irrigation agriculture on the social economic development of mwelo sub country in Tororo district and among which includes; it has led to the development of nearby trading centers (10%), source of food for the community (15%), source of income (20%), source of employment (20%), establishment of roads (10%), relationship with other communities (10%), recreation center (15%). This was obtained through interview curried out on the residents of mwelo parish as well as the questionnaire filled by the local leaders of mwelo parish. This is shown in the table

Table 4.1 shows the positive effects of irrigation agriculture to the social economic development of mwelo.

Positive effects of irrigation agriculture to the social economic development of mwelo sub county	Frequency	Percentage
Development of the nearby trading centers	10	14%
Source of food for the community	12	17%
Source of income for the employees	15	21%
Source of employment	13	18%
Establishment of roads	5	7%
Relationship with the nearby villages	7	10%
Recreation center	9	13%

Figure 4.1: positive effects of irrigation agriculture to the social economic development of mwelo



The study found out that the most important benefit of irrigation agriculture is that it provides income to some people such as the security personnel who take care of the scheme, as well as the farmers themselves who invest in the farm as they grow their crops and end up selling for example tomatoes as well as greens and counts for 21%. the people employed are mostly the residents of mwelo parish although some also come from mulanda.

4.1.2 Source of employment to the community members

The study also shows that the scheme has made many people to get what to do in what is known as jobs and this accounts for 18 % of the benefits of irrigation scheme. The majority are engaged in planting of perishable crops such as tomatoes, greens and so on.

4.13 Source of food for the community members.

The findings also show that the scheme also leads to the production of crops that feed the growing population in mwelo. However, this is not to a large extend because the land does not lead to high yield as expected due to poor management of the scheme as well as the infertility of the land. But this accounts for 17% of the positive effects of irrigation agriculture to the social economic development of mwelo. Crops grown includes; sun flower, flowers, tomatoes and so on.

Photo 4.1 shows some of the crops grown in mwelo irrigation scheme that provides food for the community members.

4.1. 4 Development of the nearby trading centers.

the study also shows that different trading centers have developed in mwelo due to the presence and the activities curried out in the scheme for example as farmers take their products to the trading centers to sale, it calls for many people who go there with aim of buying the products for example cabbages , and this has led to the growth of trading centers such as kisote trading Centre, mwelo trading centre and so on.

Photo 4.5 shows the developed kisote trading center which has been influenced by factors such as irrigation agriculture in mwelo

4.1.5 it's a recreation center.

The finding also reveals that the scheme has given a lot of people chance as they get where to relax their mind after work especially the youths who go to the scheme during holidays as well as on weekends s some go with the aim of swimming in kisote dam which is the source of water for irrigation. This benefit contributes to about 13% of the irrigation scheme.

4.1.6 Relationship with the nearby villages

The study shows that because of the scheme, the nearby villages have come close to mwelo as they buy the products from the irrigation agriculture of mwelo and this calls for 10% of the benefits of irrigation agriculture. Villages such as nyamalogo buy cabbages from mwelo irrigation agriculture.

4.1.7 Establishment of roads

The finding also shows that roads have been established to aid the access of the scheme where irrigation agriculture takes place and this accounts for 7% of the benefits. roads such as the one that joins the one of nagongera mulanda high way was established or worked upon as a result of irrigation agriculture in mwelo.

Photo 4.2 shows the road established as a result of irrigation agriculture.

4.2 Negative effects of irrigation agriculture to the social economic development of mwelo parish in mulanda sub county in Tororo district.

There are many negative effects of irrigation agriculture to the social economic development of mwelo parish basing on the research which was done using the questionnaire, interview guides as well as the observation made by the researcher and among which includes; causes accident 10 (9.8%), increased crime rates 10(9.8%), increase in prices of commodities 7(7.02%), shortage of land 8(8.4%), causes famine 11(11.2%), causes thefts 7 (7.202%), soil infertility 6(5.6%), competition with the out growers 10 (9.8%) , high taxes 6 (5.6%), flooding 7 (7.02%), low productivity 8 (8.4%) , pollution 10 (9.8 %).

Table 4.2 below shows the proportion of respondents on the negative effects of irrigation agriculture to the social economic development of mwelo parish in Tororo district

Negative effects of irrigation agriculture	frequency	percentage
Soil infertility	4	5.6%
Increase in prices of commodities	5	7.0%
Competition with the out growers	7	9.8%
Increased expenditure	4	5.6%
Land occupation	6	8.4%
Increased crime rates	7	9.8%
Increased accidents	7	9.8%
Pollution	7	9.8%
Famine	8	11.2%
Increased thefty	5	7.0%
Low productivity	7	9.8%
Flooding	5	7.0%

Figure 4.2 below shows the negative effects of irrigation agriculture

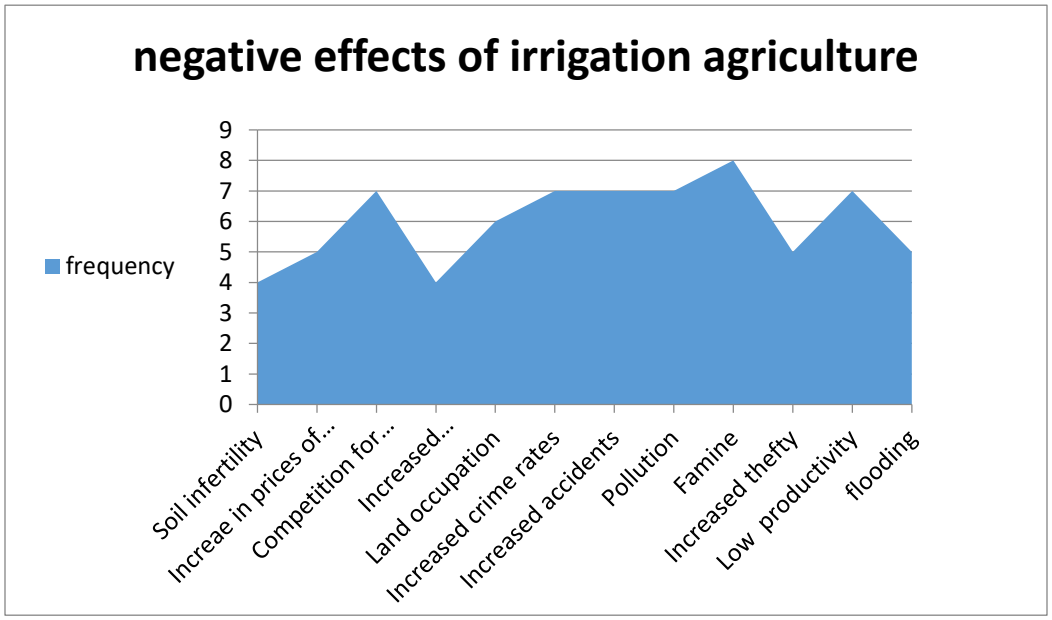


Figure4.2 negative effects of irrigation agriculture to the social economic development of mwelo parish.

4.2.1 Leads to famine.

Research found out that the majority of people complained about the irrigation agriculture as the root cause of famine this was totaled to 11 (11.2%). the residents said that since most of the crops grown are for sale for example the cabbages, tomatoes and so on that can't even be kept for long. this has left many farmers without food to feed their family as they concentrate in growing these types of crops and leave cassava that can be eaten for long, this was confirmed by the researcher as most of the farmers in mwelo do not have cassava plantation.

4.2.2 Low productivity.

The findings also show that among the negative effects of irrigation agriculture is low productivity that contributes to 10 (9.8%). this has been a result of over cultivation of land season by season without leaving it to rest and now the peace of land that used to output about 1 million Ugandan shillings is now out putting less than 700, 000 shillings only.

4.2.3 Increased crime rates.

The study also shows that among the negative effects of irrigation agriculture, there can't miss to be increased crime rates which count to 10 (9.8 %), this is said that it has been brought about as a result of the growing trading center such as kisote, mwelo trading centers and son of which they have grown because of the irrigation agriculture. on 24th of June 2023, an event was organized in mwelo trading center that called for many people from different places and people started fighting that led 3 people to prison.

4.2.4 Pollution of the environment.

The study found out that because of the scheme, there is pollution of the environment which totals to 10(9.8%). this results from the different chemicals used to spray the farm crops such as the cabbages, tomatoes and so on that spreads to the atmosphere hence causing air pollution. apart from that also the residues of the tomatoes and so on are thrown into water source which is kisote dam and yet some people use this water for home use.

4.2.5 **Increased accidents**

Research also shows that accident is one of the negative effects of irrigation agriculture and it is equal to 10(9.8%) of the negative effects. since the irrigation scheme was established, 2 people have died including young girl of about 10 years as they try to have leisure through swimming in kisote dam which is the source of water for irrigation.

4.2.6 Competition with the out growers.

The study also shows that competition is one of the negative effects of irrigation agriculture and it contributes to 10 (9.8%). the out growers who do not have acres to grow crops from the scheme due to over charges are crying that now during dry season, the crops are always of low quality compared to the one of the farm and therefore buyers prefer buying the one from the farm and leave theirs which makes them earn little.

4.2.7Land occupation.

The study reveals that land occupation is one of the negative effects of irrigation agriculture and it contributes to 8(8.4%). the scheme has covered 42 acres of land which was taken away from the people by the government of Uganda with the aim of development but currently if one of the former owners of the land is in need of using the land he or she has to pay for it before using and not just a little amount of money.

4.2.8 Increased thefty.

The study found out that the irrigation scheme has led to increased theft in the area and this makes 7(7.0%) of the negative effects. This has been realized as many people go to mwelo with the aim of getting land for cultivation or with the aim of refreshing their minds after work when actually they have got their own target of stealing, they don't only steal in the farm but also go ahead and steal people's properties outside the farm in people's homes for example 2 pigs plus one goat were stolen from Owor Michael's home on 18th of July 2023 and the suspected thieves are the people who were seen around the scheme during day.

4.2.9 Increase in prices of commodities.

The finding reveals that one of the negative effects of irrigation agriculture is the increase in prices of commodities and this contributes to 7 (7.0%). as a result of irrigation agriculture, mwelo has slightly developed and therefore since it has been in the record that for the place to be considered developed, the prices of commodities have to develop, the roasted meat which is sold in Namwaya which is the nearby village at 1000shillings is sold in mwelo at 2000 shillings.

4.2.10 Flooding.

The study shows that flooding can't be avoided when talking about the negative effects of irrigation agriculture in mwelo and it contributes to 7 (7.0%). this always happen when there is much rain fall in the area that ends up filling kisote dam which is the source of water for irrigation and therefore end up destroying people's properties such as crops for example in October of 2023, about 4 acres of rice plantation was swept away by flood and left farmers with tears.

Photo 4.3 shows the flooded garden as a result of over flow of kisote dam which was established as a result of irrigation agriculture.

4.2.11 Soil infertility.

The study also reveals that one of the negative effects of irrigation agriculture is soil infertility and it contributes to 6(5.6%). this is seen as the soil which used to yield tomatoes worth 1 million is now yielding tomatoes worth below 700 000 shillings and also sometimes crops can be gro0wn then it just fails to grow or delay to grow, the infertility is caused by soil erosion resulting from flooding.

4.3 Mitigation measures to the negative effects of irrigation agriculture on the social economic development of mwelo parish in mulanda Sub County.

There are many mitigation measures to the negative effects of irrigation agriculture according to the research, which was carried out through questionnaire and interview guide, and each contributes to the following percentages. Application of fertilizers which increases on soil fertility 8.6(9%), use of improved seeds 11.5 (12%), employing of security personnel to keep the farm from thefty of crops 9.6 (10%), offering of discount for the customers on land fee 9.6(10%), proper disposal of waste materials 9.6(10%), putting of restrictions on people who go for swimming to avoid accident 7.6 (8%), crop rotation 7.6 (8%), out growing of other crops 6.7(7%), digging of water channels 6.7(7%), constructing of police post 5.7(6%), having self-awareness 5.7 (6%), local security council 5.7 (6%), spraying during morning 4.8(5%).

Table 4.3 below shows the results obtained from the respondents about the mitigation measures to the negative effects of irrigation agriculture on the social economic development o0f mwelo.

Mitigation measures	**Frequency**	**percentage**
Application of fertilizers	**9**	**9%**
Spraying in the morning and evening	**5**	**5%**
Employing of security personnel	**10**	**10%**
Digging of the water channels	**7**	**7%**
Restrictions on the children who go for swimming	**8**	**8%**
Establishment of the police post	**6**	**6%**
Sensitization of the masses about the benefit	**6**	**6%**
Out growing of other crops	**9**	**7%**
Crop rotation	**5**	**8%**
Giving of discount for land	**10**	**10%**
Planting improved seeds	**12**	**12%**
Employing local security	**6**	**6%**
Proper disposal of waste	**10**	**10%**

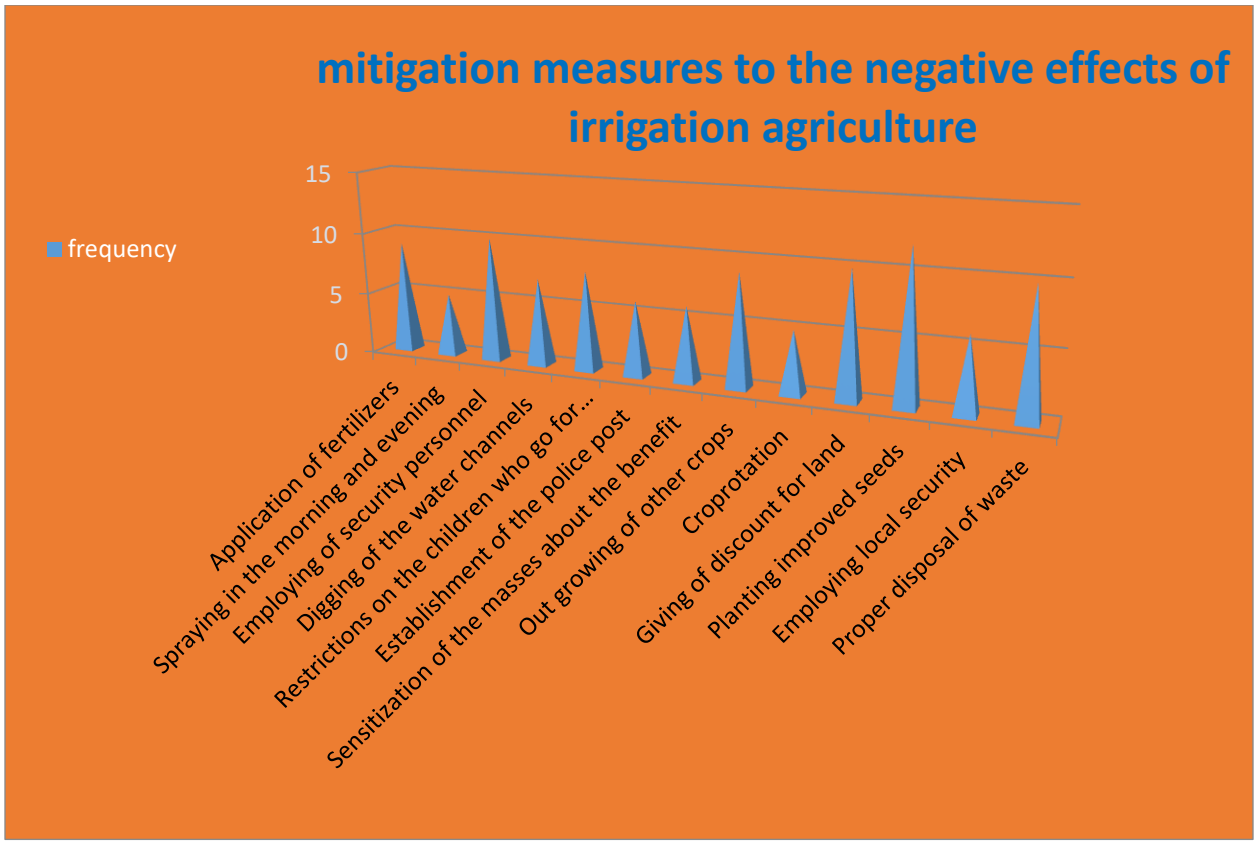


Figure 4.3 shows the mitigation measures to the negative effects of irrigation agriculture on the social economic development of mwelo in Tororo district.

4.3.1 Planting of improved seeds.

The finding shows that planting of improved variety of seeds have should be adopted in mwelo irrigation farm to solve the problem of low production and this totals to 11.5 (12%). the improved tomato seeds which yield to high quality tomato that can stay for about 5 days without getting rotten and the variety is called by them as “olacho top” which means it has defeated rotting case.

4.3.2 Giving of discount on land rent.

The research found out that farmers are given some discount most especially the ones who have been using the land for some good time and this contributes to 9.6(10%), the plots have been divided for amount worth 100000- (one hundred thousand shillings) each and in case farmer wants about 2 plots he can pay around 90 thousand on each meaning he will have to pay 180 thousand in general.

4.3.3 Proper disposal of trash products from the farm.

the study also reveals that proper disposal of tomato trash is one of the mitigation measures of irrigation agriculture in mwelo and it contributes to 9.6 (10%). initially people could just through the tomato trash anywhere including in the water source and this could bring about water

pollution but there has been an improvement where by now the farmers have to collect their trash and burn them.

4.3.4 Employing of security personnel.

The research also shows that security personnel's have been employed as one of the mitigation measure of the negative effects of irrigation agriculture and it contributes to 9.6(10%). two askaris with arrows and pangas have been employed to take care of the farm as they try to prevent the unauthorized people from accessing the farm.

4.3.5 Application of fertilizers.

The finding also reveals that fertilizer application is one of the mitigation measures to the negative effects of irrigation agriculture and it contributes to 8.6 (9%). The fertilizers are always both in liquid and powdered form, for example the dude mark, rocket and so on are the types of fertilizers which are always applied. this improves on the variety of the crops most especially the tomatoes.

4.3.6 Out growing of other crops.

The finding also reveals that there is out growing of other types of crops out of the farm as another mitigation measure to the negative effects of irrigation agriculture and it contributes to 6.7 (7%). This crops includes cassava, potatoes, maize and so on as the means of supplementing the in growing crops that does not take long in the store. they are majorly grown along mwelo _mulanda road.

Photo 4.4 shows some of the crops grown out of the irrigation farm to supplement the little grown in the farm.

4.3.7 Restrictions on the children who go for swimming.

The finding also stated that restrictions have been put in place to safe guard the children who go to the water source and end up drowning in water as they are swimming and this contributes to 7.6 (8%). The elders have put much restrictions on the children who swim in kisote dam in a way that if they have never seen you swimming, they hardly allow you to enter in the water.

4.3.8 Crop rotation.

The study also shows that crop rotation is being practiced in mwelo to solve the problem of low productivity of the land and this contributes to 7.6 (8%). The farmers have now adopted to planting of different crops at least after every season, for example if cabbage has been removed them they can decide to plant tomato next and this has made some improvement.

4.3.9 Construction of the water channels.

The study reveals that water channel have been dug to ensure that flooding is avoided and it contributes to 6.7 (7%). the water channel takes away the excess water which would flood and now it has again helped in a way that during rainy season, the farmers follow the channel as they get fish to supplement their diet.

4.3.10 Establishment of police post.

The research shows that police post has been established to curb the criminals who commit crimes as a result of the irrigation scheme. This mitigation measure contributes to 5.7 (6%). The police post is in Busia trading center in mwelo along nagongera _pajwenda road and this has reduced so many crimes in mwelo.

4.3.11 Sensitization of masses about the benefits of the scheme.

The study reveals that masses are being sensitized about the benefits of the scheme as some of the mitigation measures to the negative effects of irrigation agriculture and it contributes to 5.7 (6%) .the local leaders through the government of Uganda always organize a concerned meeting with the community members and discuss with them some of the benefits of the scheme so that they don't leave the scheme idle .the recent meeting was held on 10th of October 2023 in mwelo primary school that was attended by 321 members and the guest of honor was the local council 5 chairperson Tororo district.

4.3.12 Forming of local security team.

The study also reveals that among the mitigation measures for the negative effects of irrigation agriculture is forming local security team and this contributes to 5.7 (6%). The team comprises of 10 members every 10 homes and it is called the "nyumba kum" meaning a team comprising of 10 houses, the team move at night and they start their journey at 9pm every night until late, they have captured several thieves since they were formed.

4.3.13 Spraying only in the morning and evening.

the finding shows that spraying of crops are only done in the morning and evening as one of the mitigation measure to the negative effects of irrigation agriculture and it contributes to 4.8(5%). This is done to avoid air pollution which could affect the neighbors if this was to be done at mid-day when people are getting their lunch.

CHAPTER FIVE: DISCUSSION, CONCLUSION, AND RECOMMENDATION OF RESULTS OR FINDINGS.

5.0 Introduction

This chapter presents discussion, conclusion, and recommendations of the findings of the research carried out in mwelo parish in Tororo district.

5.1 Discussion

5.1.1 Positive effects of irrigation agriculture on the social economic development of mwelo parish in Tororo district.

Source of income is the major positive effect of irrigation agriculture in mwelo parish in mulanda sub county with the highest percentage of 21%. this is brought about as farmers sell their products from the farm for example the cabbages, the greens as well as the tomatoes and the type of income here is termed as the rural income according to Mendula and Mariana 2013. however, he income is not for everyone as the irrigation scheme is not all that big and also due to the location of the scheme in the village where many people can grow their own greens even though out of the scheme, the income tends to lower down.

Source of employment is another positive effect of irrigation agriculture as it contributes to 18%. people have been self-employed I their farms as they manage their own farms, others have been employed as security guards to take care of the farm and at the end they get something for survival.

The scheme also provides food for the community members and this counts as some of the positive effects of irrigation agriculture and this contributes to about 17%. `this is related to Siebert (2010) whop sad that irrigation areas provide stable source of food for communities across different regions the crops grown includes, tomatoes, cabbages, beans, sorghum and so on and this helps most especially during dry season that it is difficult to depend on the natural rain. However, the crops are not enough because of the low yield resulting from the infertility of the land.

The scheme has led to establishment of new infrastructures such as roads in mwelo which was not there before the scheme and this counts as one of the positive effects of irrigation agriculture

which contributes to 7 %. These roads include that which joins nagongera – mulanda road from the scheme. This road has helped farmers to output their crops from the swamp to the main road that links them to the market centre. This is related to (IFAD, 2009) that said, the construction and maintenance of irrigation system can stimulate infrastructure development in rural areas leading to improved transportation, communication and access to the market, however, the roads are still under developed to the extent that during rainy season, it disturbs the farmers as the vehicles cannot move to the swamp.

Development of the nearby trading center, many of the respondents suggested that irrigation agriculture has also led to the development of the nearby trading centers and this counted for 14% of the respondents. the trading centers includes mwelo trading Centre, kisote trading Centre and so on. that in the evening, farmers after selling their agricultural products they go to this trading centers to spend their money accordingly and they claim that this is assign of their standard of living being improved. This is in relation to (FAO, 2002) that states that the economic benefit of irrigation agriculture can lead to improved living standards for local communities through increased household income and access to nutritious food.

It's a recreation center. there some respondents who said that among the positive effects of irrigation agriculture is that it acts as a recreation center to the holiday makers and this counts to 13% of the respondents. They go to the scheme at around 4 pm and have fan there for around 2-3 hours up to around 6 pm – 7 pm every day as some go there to play different games such as Omweso, cards and this keeps them busy however, it is these very holiday makers who practice ill behaviors as they go there for example they end up smoking which harms the environment.

Relationship with other community members. The scheme has made the members of mwelo to be known officially by other communities such as nagongera, Namalogo and so on. this has been as a result of these other communities buying the product from mwelo irrigation scheme such as tomatoes, cabbages and so on and this has brought in social cohesion among these people which is in relationship with (world bank 2015) which states that irrigation agriculture can bring in social cohesion by providing a common goal for community members to work towards leading to increased cooperation and collaboration among residents.

5.1.2 NEGATIVE EFFECTS OF IRRIGATION AGRICULTURE ON THE SOCIAL ECONOMIC DEVELOPMENT OF MWELO PARISH IN MULANDA SUBCOUNTY IN TORORO DISTRICT.

Pollution is one of the negative effects of irrigation agriculture and it contributes to the highest percentage which is about 11.2%. this is brought about as a result of spraying the crops especially the tomato which is sprayed regularly in a period of 3 days each and this affects people of the surrounding communities. this is in relation with MC Donald 2012 which says that irrigation induced contamination of water and soils in the terbal water shed using environmental tracers.

Soil infertility this is another negative effect of irrigation agriculture and it contributes to 6%. this results from over cultivation of the land as people do not want the land to rest and also planting of the same type of crop season after season without changing. this leaves the land un productive hence giving of low yields however, according to la I, R, (2015), this needs restoring of soil quality to mitigate soil degradation.

Increase in prices of commodities. this contributes to 7% of the negative effects of irrigation agriculture this comes a result of development of the trading centers that attract more customers and as its stated in economics that the higher the demand the higher the prices of commodities. this makes the farmers as well as the people who buy from them to sale the crops at a very expensive price and this is related to Gandner, Bl (1997), which states that the farmer – retail price spread in a competitive food industry.

Low productivity. Some respondents claimed that among the negative effects of irrigation agriculture is low productivity and this contributes to 9.8% of the respondents. this results from over cultivation of the land and mostly the crops grown are of one type which makes the soil un productive leading to low yield.

Famine. This was said by 11.2 % of the respondents as one of the negative effects of irrigation agriculture, farmers of mwelo now focus on mainly growing of crops for sale and yet the money which is got cannot afford to buy food to feed the growing population of mwelo. this explain why mostly food sellers make large sales on daily basis in mwelo.

Increased accidents. Some of the respondents blamed the irrigation scheme as the root cause of accidents in mwelo and this counted for 9.8 % of the respondents. Mostly are children who go for swimming and end up drowning in the deep kisote dam which is the source of water for irrigation, however, there are also some mature people who drown accidentally.

Competition with the out growers. There is a great competition with the out growers who also grow the same type of crop with the one if the irrigation scheme, for example the tomatoes, sorghum, greens and so on and yet some time they may be selling at a lower price compared to the one from the scheme, this out competes the one of the scheme in terms of market.

Increased crime rates. The respondents also claimed that because of the irrigation agriculture, there is increased crime rates and this contributed to 9.8 of the respondents. As the trading centers grow resulting from the irrigation scheme in the other way round, it carries many people among which are dangerous youths who end up committing different crimes such as fighting the elders, stealing, robbing and so on.

Land occupation. This is a prominent problem according to the respondent's reason is that while the residents who claimed for this were speaking, they spoke with their tears out and they contributed to 8.4 % of the respondents. this is in relation with (Renwick, 2016), that irrigation agriculture often requires the construction of dams and reservoirs leading to displacement of people from their ancestral land.

Increased thefty. The respondents totaled to 7 % of the total respondents claimed that irrigation they also practice ill behaviors among which includes thefty. the most common items being

stolen by these holiday makers includes, tomatoes, cabbages as they look for the way of selling to get money for their gambling games such as cards.

Flooding, this is also part of the negative effects of irrigation agriculture in mwelo. This results always during rainy season that results to increase in water level in kisote dam hence the excess water starts to pour out destroying people's crops such as rice which is near the scheme.

Increased expenditure, some respondents also claimed that because of the irrigation agriculture, increased expenditure cannot be avoided and they totaled to 5.6 % of the respondents. these results from the developing trading centers of mwelo, kisote, and so on and for them, for a place to be developed, the expenditure also has to increase, apart from that the farmers also end up spending a lot in the farm for example to buy the seeds, fertilizers as well as other needed requirements and yet at the end they gain little.

5.1.3 SOLUTION TO THE NEGATIVE EFFECT OF IRRIGATION AGRICULTURE TO THE SOCIAL ECONOMIC DEVELOPMENT OF MWELO PARISH IN MULANDA UB COUNTY IN TORORO District

Planting of improved seeds become the major mitigation measure to the negative effects of irrigation agriculture as it contributes to 12%. examples of improved seeds include spinner which is another type of Sukuma and this grows at Avery fat rate compared to the old type of Sukuma. this is related to John Smith, David Brown (2014) et al that says that planting improved seeds has got impact on crop yield such as improved resistance to pest and diseases, higher output and so on.

Employment of security personnel has been done in mwelo irrigation scheme to take care of the crops in the farm as one of the mitigation measures to negative effect of irrigation agriculture and it contributes to 10%. And this is in relation with Mano 2023 that it is of reducing disciplinary challenges at great rate. However, due to the poor working condition, the employed security personnel work at their own will hence making some of the crops to be stolen still.

Restriction on children who go for swimming in the water source becomes another mitigation measure to the negative effects of irrigation agriculture and this contributes to 8%. this is done to avoid accidents which results from un controlled access to the open water by children. This is in relation to Oliver Gemmell (2019) that states that restrictions on open water bodies giving various reasons for restrictions such as safety concern.

Formation of local security council which contributes to 6%. The council consists of every 10 households that comprise of 1o energetic men with logs as well as metals. they move as they exchange the area of operation with another group of the council. this is in relation to Abellera (2018) that says that councils are often formed in response to local security concern and aim to collaborate with low enforcement agencies, local government and community members to maintain peace and order.

There is crop rotation where different crops are4 grown on one piece of land after every season, this helps to restore soil fertility for example if sorghum is harvested, it can be followed by tomato growing such that even the pest which had attacked sorghum will be affected as they take long to get used to tomato. This is in line with Majumdar et al (2013) that states that by rotating different crops inn planned sequence, farmers can diversify then produce optimize nutrient availability, disrupt pest and diseases and improve on soil wealth.

Police post has been established in Busia trading centre to deal with the increased crime rate resulting from irrigation agriculture. However, the police post has been established somehow far from the scheme and this still gives a privilege to some criminals. this is in relation with Junhee (2017), urban planning and development that says that there should be optimal location for police posts considering spatial and temporal crime patterns.

Proper disposal of waste products. some respondents suggested that among some of the mitigation measures to the negative effects includes proper disposal of wastes and this counts for 10 % of the respondents. The residue from the garden such tomato trash needs to be thrown far away and burnt if possible other than throwing in the water source.

Giving of discount on land rent. The discount is being given to the farmers most especially the daily customers in a way that sometimes f a farmer grows a certain crop then fails to do well, he is given another chance as he pays less compared to the fresh tenant, this will call more farmers to the farm.

Application of fertilizers. this has been done to make sure that the land productivity is improved such that the crops can do well and production be boosted. Powdered fertilizer is the most commonly used in the farm, however this is expensive and therefore most of the farmers cannot afford hence they need to adopt to artificial fertilizer making which will quite save their pocket.

Out growing of other crops. this has been done away from the scheme to make sure that as the crops in the scheme is for money, other crops such as cassava, potatoes and so on are grown out of the scheme for home consumption, this will help in boosting food production and also will reduce the rate of famine by some percentage.

Digging of water channel. This has been done to curb the challenge of flood which has been prominent during rainy season in mwelo. The channel now helps to take away the excess water which is again used for catching fish when it rains heavily as fish tends to follow the channel. The channel also helps to supply water to some of the out growing crops such as the rice grown in the swamp near the scheme.

Sensitization of the masses. this has been done by the area leaders such as the local councils, councilors and so on as they sensitize the masses about the prequations to be taken while managing the water sources such that they don’t miss use the water source for irrigation. For example, the children who go to swim in kisote dam are being advised to take care of their lives, and also to swim if and only they have the skill, this will reduce the rate of accident.

Spraying in the morning and evening. This is done to avoid pollution of the environment. It’s done at that time when the molecules cannot move at a faster rate. its known that at that time, it

finds when many people are not eating and therefore the rate of air pollution is reduced, however, water pollution is still rampant as the chemicals enter in the water body leading to some diseases which may hinder people's lives.

5.2 Conclusion.

The study aims at finding the positive effects of irrigation agriculture to the social economic development of mwelo parish in mulanda sub county in Tororo district and among which include; source of food, source of income, establishment of roads, relationship with the community members, source of employment, development of the trading centers.

The negative effects of irrigation agriculture to the social economic development of mwelo and they include; soil infertility, increase in prices of commodities, competition with the out growers, increased expenditure, land occupation, increased crime rates, increased accidents, pollution, famine, increased theft, low production, flooding.

Mitigation measures to the negative effects of irrigation agriculture on the social economic development of mwelo which include; application of fertilizers, spraying in the morning and evening, employing of security personnel, digging of water channel, restriction on children who go for swimming, establishment of police post, sensitization of masses, out growing of other crops, crop rotation, offering discount, improved seeds, local security, proper disposal of waste.

5.3 Recommendations

From the findings of research, it is recommended that the government should play a great role to mitigate the negative effects of irrigation agriculture such as improvement of mwelo police post to police station, training of farmers to improve on their farming kills, enlarging of the farm to increase on the productivity, fencing of the water source to avoid accidents.

5.4 Areas for further research.

Further findings should be done on why irrigation agriculture is still a challenge despite the mitigation measures that have been put in place.

Other research should be carried out on the;

1 Factors hindering the development of irrigation agriculture in mwelo.

2 Factors favoring the development of irrigation agriculture in mwelo.

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APPENDICES

APPENDICES I

QUESTOPNNARE TO THE LOCAL COUNCIL LEADERS (LCI, LCII, LCIII AND SUB COUNTY COUNCILLORS)

TOPIC: EFFECTS OF IRRIGATION AGRICULTURE ON THE SOCIAL ECONOMIC DEVELOPMENT OF MWELO PARISH IN MULANDA SUBCOUNTY TORORO DISTRICT.

Dear respondent,

Iam **OFWONO KENETH** a student of Busitema University currently carrying out a research work on the above topic, please you have been chosen as respondent to contribute towards this research study. all the information given in this study will be highly kept confidential and will be used for academic purposes only, therefore feel free.

INSTRUCTIONS

Please tick on the appropriate response in the box below.

SECTION A

DEMOGRAPHIC CHARACTERISTICS

Sex;

Male ☐ female ☐

Age;

18-25 year ☐ 26-34 year ☐ 35-40 ye ☐ 40 years and ☐ ove

Marital status;

Sing ☐ marrie ☐ divo ☐ wi ☐ ed

level of education.

None ☐ primary ☐ second ☐

occupation.

Farmer ☐ self-employed ☐ government wor ☐ other sp ☐

How long have you been in this village?

1Week – I year ☐ 2- 3 ye ☐ 6- 10 ☐ s 10 years an ☐ ove

How do people earn income in your area?

Sell of agricultural produc ☐

☐

Salaries from their jobs

Businesses ☐

SECTION B

Do people in your area know the effects of irrigation agriculture?

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if yes, what are the common positive effects of irrigation agriculture in the area that you lead?

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if no, what are the common negative effects of irrigation agriculture in the area that you lead?

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what are some of the mitigation measures to the negative effects of irrigation agriculture on the social economic development of your area?

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Give your suggestions if you have any.

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@@@@@thank you so much for your participation and time given. May the almighty God reward you@@@@

APPENDIX II

INTERVIW GUIDE: PEOPLE STAYING IN MWELO PARISH

TOPIC: EFFECTS OF IRRIGATIN AGRICULTURETO THE SOCIAL ECONOMIC DEVELOPMENT OF MWELO PARISH IN MULANDA SUB COUNTY TORORO DISTRICT.

Hello, my name is **OFWONO KENETH,** student of Busitema university faculty of science and education just in nagongera campus here. Today am here conducting my research in the effects of irrigation agriculture on the social economic development of mwelo .and you have been chosen as one of the respondents to contribute towards this research study and I want to assure you that all the information that you're going to give will be considered confidential therefore fell free to respond.

1, kindly what is your name please?

2, how old are you?

3, what is your designation?

4, are you married or not?

5, what is your qualification?

6, for how long have you been in this area?

7, do people in your area aware of the effects of irrigation agriculture to the social economic development of this area?

8, then as you have you witnessed some of the effects of irrigation agriculture to the social economic development of this area?

9, if yes, then what are some of the positive effects of irrigation agriculture to the social economic development of this area?

10, what are some of the negative effects of irrigation agriculture to the social economic development of this area?

11, what are some of the mitigation measures being put in place to solve the negative effects of irrigation agriculture?

12, is there any other thing that you would like to share with me?

"IF NOT" @@@ THANK YOU FOR YOUR PARTICIPATION @@@.

APPENDIX III

OBSEVATION GUIDE

TOPIC: EFFECTS OF IRRIGATION AGRICULTURE TO THE SOCIAL ECONOMIC DEVELOPMENT OF MWELO PARISH IN MULANDA SUBCOUNTY IN TORORO DISTRICT.

DATE……

PLACE…….

1	Are there some positive effects of irrigation agriculture?	
2	The type of houses in mwelo parish	
3	Are people doing well in terms of development?	

4	What are some of the crops grown in the farm?	