

**POTENTIAL CONTRIBUTION OF PERI-URBAN WETLANDS TO
LIVELIHOOD OF LOCAL COMMUNITIES IN SHINYANGA MUNICIPALITY**

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**A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE
REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN
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ABSTRACT

The study was conducted in Shinyanga Municipality, Tanzania to assess the potential contribution of peri-urban wetlands to livelihood of adjacent communities. The specific objectives were to examine the contribution of the peri-urban wetland ecosystems to natural capital– (food production/food security), evaluate the contribution of peri-urban wetlands ecosystem to financial capital –(household income) and assess the benefits received by farmer groups/associations formed around the utilization of wetlands (social capital). Data were collected through households and farmer’s group/associations questionnaires, focus group discussion and field observations. Data were analyzed using descriptive and inferential statistics where correlation and t-test were applied. It was observed that 79.2% of the wetland adjacent communities depend on the wetlands for food. The major food crops were paddy, vegetables, fruits and sweet potatoes. The mean production levels of cereals, vegetables and fruits were significantly higher in wetlands compared to uplands ($P \leq 0.001$). In the case of household income wetland cultivation (paddy, maize, vegetables and fruits) generated statistically higher household annual mean income of Tshs 2,335,852/year (US\$ 1,168) compared to Tshs 197,475/year (US\$ 99) generated by upland cultivation ($P \leq 0.001$). The findings further indicated that 70% of the farmer groups/associations formed around wetland utilization accessed loans/credit to support agricultural production as benefit from being members. Sustainable utilization of peri-urban wetlands in Shinyanga Municipality generates substantial livelihoods to adjacent communities. Conservation of such wetland ecosystems is imperative for continued contribution to livelihoods while ensuring environmental conservation. Further studies are necessary to unveil the nature of social capital associated with utilization of wetland ecosystems.

DECLARATION

I, Mohamed Yusuph, do hereby declare to the Senate of Sokoine University of Agriculture that this dissertation is my own original work done within the period of registration and that it has neither been submitted nor being concurrently submitted in any other institution.

Mohamed Yusuph
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Date

The above declaration confirmed

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DEDICATION

This research work is dedicated to my mother, the late Tausi Mohamed who created a strong foundation for my education carriers since primary education up to this level. May her soul rest in Eternal Peace.

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LIST OF ABBREVIATION AND ACRONYMS

CBOs	Community Based Organisation
ESP	Environmental Support Programme
FAO	Food and Agriculture Organisation
FGD	Focus Group Discussion
Ha	Hectares
IWMI	International Water Management Institute
Kgs	Kilograms
MNRT	Ministry of Natural Resources and Tourism
NBS	National Bureau of Statistic
NGOs	Non-Governmental Organisation
SNAL	Sokoine National Agriculture Library
SPSS	Statistical Package for Social Sciences
Tshs	Tanzania Shilings
URT	United Republic of Tanzania
US \$	United States Dollar
USA	United States of America
WHO	World Health Organisation

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background Information

Wetlands have been considered as a human life form resource for a long period of time on earth which has provided important resources and offer shelter and food for human being and other life forms (Ramsar Convention Bureau, 2002). It estimated that wetlands cover about 0.6% of the earth surface (Economics for the Environment Consultancy, 2005). Wetlands are among of the world's most biologically productive ecosystems and are rich in ecological species diversity (Munishi and Kilungu, 2004) and they contribute to livelihoods of billions people in the world and millions of people in Africa through goods and services to a variety of users (IWMI, 2010). The livelihoods of many people depends on wetlands for a variety of goods and services such as the harvesting of resources (forest, wildlife, forage and fish), livestock grazing and water supply (Dugan, 1990). In Eastern Africa wetlands cover about 4% of a total area of landscape (Gichuki and Macharia, 2006). Tanzania is among of county which is gifted with unique wetland resources in which 10% of the country is covered by wetland ecosystems. These ecosystems in Tanzania range from large lake systems to river floodplains, deltaic mangrove formations and associated catchments (Maltby, 1986). Wetlands in Tanzania are among of productive ecosystems in case of agricultural production, fish production and source of pasture for livestock (Kashaigili, 2006). Apart from agriculture and fishing, wetlands have significant importance to human well being in term of economic, social, cultural and biological values where they generate income and employment to household and communities living adjacent to the wetlands. The Government of Tanzania has shown its concern towards wise use of wetlands through local communities participation in the management and recognition of wetlands as significant natural resources, ecosystem services and biological

values by ratifying the Ramsar convention on wetlands in 2000 (ESP, 2003; MNRT, 2004). Over, the past decades, there has been an increasing influx of people into wetland areas as a coping strategy, especially in areas where uplands are predominantly characterized by low agricultural potential, dominated by poor soils and low unpredictable rainfall due to climate change (Turyahabwe *et al.*, 2013).

1.2 Problem Statement and Justification

A number of studies have been undertaken such as the role of wetland common pool resources on crop production in dry areas, wetland contribution to livelihoods of Tanzanians and importance of wetlands in agriculture (Kamukala *et al.*, 1993; Mkavinda and Kaswamila, 2001; McCartney and Van Koppen, 2004; Shemdoe *et al.*, 2006). Those studies concentrated on large wetlands especially those categorized as Ramsar Wetland Sites and there was less focus on understanding the economic values of smaller wetlands especially those which found in peri-urban areas, most likely, because they were considered unimportant (Adekola *et al.*, 2008).

However, small-scale wetlands are extensively used for subsistence and slight commercial agriculture in urban areas. Thus, economic valuation of the direct use values of small wetlands improves awareness and is critical to planning for their sustainable management and wise use (Ramsar Convention Secretariat, 2004). Shinyanga region especially Shinyanga Municipality is the among of Shinyanga district which has a number of small wetlands which are located adjacent to urban area and these wetlands have been used for agricultural production especially during dry season and wet season for paddy, vegetables, sugarcane and maize production. During dry season most of people rely on wetlands for agricultural production because of prolong drought in dry land (Grimble *et al.*, 2002).

Due to gap which exist on the study where many researchers took much concern on conducting research to large wetlands and take little concern with those small wetlands where peri -urban wetlands are part of small wetlands hence the study was intended to fill the gap by generating information. The study investigated potential contribution of peri-urban wetland to livelihood of local communities. The findings generated information , will be used by researchers to conduct more research to these small peri-urban wetlands to other places in the country to know the potential of these peri-urban wetland to local community all over the country and to come up with sustainable conservation strategies to these peri-urban wetland which are not taken much consideration by the country policies and researchers and other national and international environmental conservation stakeholders (NGOs and CBOs).

1.3 Objectives of the Research

1.3.1 Overall objective

The overall objective of the study was to investigate potential contribution of peri-urban wetlands to livelihood of local communities in Shinyanga Municipality.

1.3.2 Specific objectives

- i. Examine the contribution of peri-urban wetland ecosystems to natural capital (land)– food production/food security.
- ii. Evaluate the contribution of peri-urban wetlands ecosystem to financial capital - household income.
- iii. Assess benefits received by farmer groups/associations (formal/informal) formed around the utilization of wetlands (social capital) in the study area.

1.4 Research Questions

- i. What are the contributions of peri-urban wetland ecosystems to natural capital (land) – food production/food security?
- ii. To what extent peri-urban wetland ecosystems contributed to financial capital - household income?
- iii. How do farmer groups/associations (formal/informal) benefit through utilization of wetlands (social capital)?

1.5 Problems Encountered in the Study

- i. The major problem was concern with absence of head of household in their home place at a time of conducting interview and this problem occurred because most of them went to their farmland. A researcher handled this problem by visiting them to their farmland and able to acquire information.
- ii. There was a problem of lack of standard measurements. Many interviewed farmers use heaps, cups, bowls and tins, small and big plastic containers and bags of different capacities to measure quantities of different food products. The researcher had to convert the local measurements into standard units through weighing and averaging.
- iii. Inaccessibility of some areas in the wetland. These happen because during data collection it was the season of rainfall therefore huge agricultural land were covered by water. A researcher overcomes this problem by requesting respondents to move to dry land where there was no water cover and able to interview them.

CHAPTER TWO

2.0 LITERATURE REVIEWS

2.1 Definition of Wetlands

Peri-urban wetlands are those wetlands that are found in the areas adjacent to city or town (Australia Government, 2013). The Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar, 1971), defines wetlands as "areas of marsh, fen, peat land or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres". Furthermore, wetlands "may incorporate riparian and coastal zones adjacent to the wetlands, and islands or bodies of marine water deeper than six metres at low tide lying within the wetlands". Primarily, the factor that distinguishes wetlands from other land forms or water bodies is the characteristic vegetation that is adapted to its unique soil conditions: Wetlands consist primarily of hydric soil, which supports aquatic plants. The water found in wetlands can be saltwater, freshwater, or brackish.

2.2 History of Wetlands and Agriculture

Wetlands were once regarded as areas with little value, where development for human purposes was under utilized. Wetlands were considered landscapes of no use and sanctuaries for pests and diseases (Williams, 1996). These perceptions led to government incentives that encouraged draining and cultivation of wetlands to transform them into economically profitable lands (Wiebe, 1997). This view of wetlands has since diminished and has been replaced by the more modern notion that wetlands are positive natural heritage features. Governments are also beginning to recognize wetlands as valuable habitats (Mitsch and Gosselink, 2000).

Government policy, such as the “Swamp buster” provisions, was a major turning point that slowed the destruction of wetlands in the USA. Under this program farmers are given government subsidies if they manage wetlands responsibly. Slowly, societies are becoming aware that wetlands hold intrinsic as well as economic benefit and, if preserved, often become more valuable than if they are drained or converted to other land, such as agricultural land.

2.3 Contribution of Wetland Cultivation to Household Food Availability

Food is the basic human need for survival, health and productivity. It is the foundation for human and economic development (Lisa *et al.*, 2006). Most households especially in developing nations are food insecure partly due to the rapid increase in human population, weather and climatic variability, and environmental degradation. For instance in 2009, it was estimated that 102 billion people were undernourished worldwide, which is about 37% higher than 20 years ago (FAO, 2009). Sub-Saharan Africa and South Asia are the regions most affected by food insecurity, being home to 60% of the world’s food insecure people. In the case of sub-Saharan Africa, the food situation is further aggravated by low food availability, high fluctuations in food supply and lack of innovative ideas as well as responsive policies for sustainable use and management of natural resources (Turyahabwe *et al.*, 2013).

Wetlands are an important resource in sub-Saharan Africa that sustains rural livelihoods, particularly in areas with low or unpredictable rainfall, land scarcity or where uplands have poor soil characteristics and thus low potential for agriculture (Dixon, 2002; Dixon and Wood, 2003; Halima and Munishi, 2009; Rebelo *et al.*, 2010). This is further due to the presence of water in wetlands during the dry season, combined with their natural fertility and irrigation potential (Nabahungu and Visser, 2011). Kambewa (2005) reported

that in Malawi households who had access to wetland farms in the dry seasons had enough food throughout the year where about 75% reported that they do not face food shortage from January to February.

2.4 Contribution of Wetlands Ecosystem to Natural Capital

Wetlands are recognized as an ecosystem asset which provide natural capital which are essential to meet our future social, economic and environmental needs thus why they are integrated into decision making to ensure their wise use (Brink *et al.*, 2012). Wetlands provide direct natural products such as food, water, fiber, fish, animal fodder and energy production whereas indirect products which offer environmental services such as water purification, waste water treatment, climate regulation (control extremely weather events such as floods and drought), nutrient cycling and soil formation (Millennium Ecosystem Assessment, 2003). Wetlands are essential for local communities due to natural capital which brought by, which are water for drinking, crop irrigation and other household uses, fish for selling and food, game meat e.g crocodiles, birds etc) fruits, timber for building, wood for fuel, reeds for thatching and weaving, fodder for animals, fibres for textiles, medicines, dyes and tanning (Ramsar, 2005; FAO, 2005)

2.5 The Role of Wetland Ecosystems to Household Food Production/Food Security

2.5.1 Food security

WHO (1996) defined food security as existing “when all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life”. Commonly, the concept of food security is defined as including both physical and economic access to food that meets people's dietary needs as well as their food preferences. In many countries, health problems related to dietary excess are an ever increasing threat, In fact, malnutrition and food borne diarrhea are become double burden. Food security is built

on three pillars which are food availability that is sufficient quantities of food available on a consistent basis, food access means having sufficient resources to obtain appropriate foods for a nutritious diet and food use means appropriate use based on knowledge of basic nutrition and care, as well as adequate water and sanitation (WHO, 1996). Food security is a complex sustainable development issue, linked to health through malnutrition, but also to sustainable economic development, environment, and trade. Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life (FAO, 1996).

2.5.2 Pillars of food security

2.5.2.1 Availability

Food availability relates to the supply of food through production, distribution, and exchange. Food production is determined by a variety of factors including land ownership and use; soil management; crop selection, breeding, and management; livestock breeding and management; and harvesting (Gregory *et al.*, 2005). FAO (1997) observed that crop production can be affected by changes in rainfall and temperatures.

2.5.2.2 Access

Food access refers to the affordability and allocation of food, as well as the preferences of individuals and households. The UN Committee on Economic, Social, and Cultural Rights noted that the causes of hunger and malnutrition are often not a scarcity of food but an inability to access available food, usually due to poverty (Gregory *et al.*, 2005). Poverty can limit access to food, and can also increase how vulnerable an individual or household is to food price spikes.

Ecker and Breisinger (2012) observed that access depends on whether the household has enough income to purchase food at prevailing prices or has sufficient land and other resources to grow its own food.

2.5.2.3 Utilization

Food utilization is another pillar which refers to the metabolism of food by individuals. Once food is obtained by a household, a variety of factors affect the quantity and quality of food that reaches members of the household (Tweeten, 1999). In order to achieve food security, the food ingested must be safe and must be enough to meet the physiological requirements of each individual.

2.5.2.4 Stability

Food stability refers to the ability to obtain food over time. Food security can be transitory, seasonal, or chronic. According to FAO 2007, transitory food insecurity occurs when food may be unavailable during certain periods of time which may be caused by natural disaster (drought), crop failure, instability in markets and civil war. Seasonal food insecurity can result from the regular pattern of growing seasons in food production. Chronic (or permanent) food insecurity is defined as the long-term, persistent lack of adequate food. In this case, households are constantly at risk of being unable to acquire food to meet the needs of all members (Ecker and Breisinger, 2012).

2.5.3 Household food security

Household food security exists when all members, at all times, have access to enough food for an active, healthy life. This means that food should be adequate in terms of quality, quantity, and safety and culturally acceptable and when it is not at undue risk of losing such access (FAO, 2004).

Food should be accessible and sustainable to all members at all times throughout the year. Food insecurity continues to threaten large proportions of households particularly in low-income families (FAO, 2004). Therefore there should be enough food to meet daily requirements of all members of the household.

2.5.4 Measuring household food security

Food security indicators and measures are derived from country level household income and expenditure surveys to estimate per capita caloric availability. In general the objective of food security indicators and measures is to capture some or all of the main components of food security in terms of food availability, access and utilization or adequacy (Webb *et al.*, 2006; Perez *et al.*, 2008). While availability (production and supply) and utilization/adequacy (nutritional status/anthropometric measures) seemed much easier to estimate, thus more popular, access (ability to acquire sufficient quantity and quality) remain largely elusive. Barret (2010) argued that factors influencing household food access are often context specific. Thus the financial and technical demands of collecting and analyzing data on all aspects of household's experience of food access and the development of valid and clear measures remain a huge challenge. Nevertheless several measures have been developed that aim to capture the access component of food security, with some notable examples developed by the USAID-funded Food and Nutrition Technical Assistance (FANTA) project, collaborating with Cornell and Tufts University and Afri-care and World Vision (Swindale and Bilinsky, 2006). These include Household Food Insecurity Access Scale (HFIAS) where it is a continuous measure of the degree of food insecurity (access) in the household in the previous month, Household Dietary Diversity Scale (HDDS) which measures the number of different food groups consumed over a specific reference period (24hrs/48hrs/7days), Household Hunger Scale (HHS) which measures the experience of household food deprivation based on a set of predictable

reactions, captured through a survey and summarized in a scale and Coping Strategies Index (CSI) where it assesses household behaviors and rates based on a set of varied established behaviors on how households cope with food shortages.

2.5.5 The contribution of wetland ecosystems to household food security

Food security is a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life (FAO, 2002). World Food Summit (2000) defines household food security as availability of food that insufficient, safe and nutritious that maintains healthy, active life and acceptable to all household members”. Commonly, the concept of food security is defined as including both physical and economic access to food that meets people's dietary needs as well as their food preference. Farming activities which conducted on wetlands are the major contributor of household food security by farming different crops such as paddy, maize and various types of vegetables and fruits (Kilungu and Munishi, 2009). The practise of growing rice in swamp areas is increasing in many African countries and the world at large. Between of 1974-75, Tanzania produced 160 000 tones of paddy from its wetlands (Loma, 1979). Paddy and maize productions in wetland ecosystem lead the country to have enough stock of food through the year as well as ensure food security in a level of household. The main harvest from wetlands is just ready when the supply of food from the upland fields is running out for many households and the “hungry season” is just starting (Abbort and Hailu, 2000). Paddy rice is grown in swampy, riverside ecosystem in the Nile belt, Lake Victoria basin in East Africa and Indus basin in India (Revenga and Kura, 2003). Fish products also ensure food security to household level and country as all where by Jackson (1975), estimates that 51 000 sq. km of freshwater and 10 000 family fishponds produce 83

percent of Tanzanian total fish catches by weight, and 60percent by value (Kilungu and Munishi, 2009).

2.6 Contribution of Wetlands Ecosystem to Household Income

Researchers have provided empirical evidence that wetlands are among of sensitive productive areas with significance contribution to rural livelihoods and household income (Ngailo *et al.*, 2002, Munishi and Kilungu, 2004; wambura *et al.*, 2004). Annual incomes from wetlands in Tanzania and Zambia can be high as US \$ 1,000 per household (or 90% of the total household income) with high variation across sites and households (Morandert and Tchamba, 2004). Other research studies which were conducted at Mtitu River Basin in Kilolo District (Kyando, 2007) and in the Great Ruaha River Catchment (Ngaga, 2007) reported annual income of Tsh 100 000 and 360 000 per household correspondingly. Niger wetlands food crops provided an income of between US\$ 200-4300 per hectare in 1993 (Brouwer, 2002). These household incomes are generated from direct and indirect products and services of wetlands.

2.7 Benefits Received by Wetland Farmer Groups/Association

Farmer group or organisation is defined as a formal or informal (registered or unregistered) membership-based collective action institution serving its members, who are rural dwellers that get part or their entire livelihood from agriculture (crops, livestock, fisheries and/or other rural activities). Services provided by the Farmer groups aim to improve the livelihoods of its members, and include access to advice, information, markets, inputs and advocacy (FAO, 2014). At the end of the Vietnamese war in 1975, the country faced acute hardships, as under the Communist regime, cooperative farming through communes was established. The government supplied to the farmers group seed, fertilizer and other essentials. Adrian *et al.* (2013) indicated that Bumbwisudi study was

unique because although the village councils were identified as the principal institution for controlling resource use within each village, there were also informal farmers' association/groups, the Bumbwisudi Irrigation Group (BIG), which to a large extent managed cultivation within the wetland. It had established by law affecting irrigation water use and cultivation as well as controls for pest and diseases and use of farm inputs that come from the government.

2.8 Sustainable Wetland Management

Several wetlands are under increasing pressure and in the process of losing many of their important functions, with serious consequences in the form of changed water regimes, significant conflicts over resource use, and loss of livelihood opportunities (MNRT, 2003). Many wetland areas experience a rapidly growing population with poor people moving into the areas in search of livelihood opportunities leading to a strong economic pressure for conversion of wetlands to other functions and only limited considerations are given to the sustainability of the changes. Management of wetland is still very sectoral and does not recognise the multiple functions of wetlands and existing experiences on sustainable wetland management in Tanzania are not generally available or used by key stakeholders (MNRT, 2003). Planning for land and resource use in wetlands is limited and furthermore plans are seldom put into practise. The knowledge base about wetland resources, status and key management problems is limited and no proper policy guidance is in place.

The United Republic of Tanzania officially acceded to the Convention on Wetlands (Ramsar, 1971) in August 2000, thereby demonstrating its vision and commitment towards sustainable wetland management. The Convention emphasises the need for the wise use of all wetlands (MNRT, 2003). The contracting parties define the wise use principle as the “sustainable utilisation to the benefit of people in a way compatible with the maintenance

of the natural properties of the ecosystem”. Sustainable Wetland Management is supported by a number of Ramsar resolutions and by the Convention which states that the Contracting Parties. In Tanzania, the National Wetlands Working Group (NWWG) was formed in 2001 and comprises approximately 30 wetland stakeholders at central level (MNRT, 2003). The vision of the NWWG is: “To ensure that wetlands are intact, viable and with a full complement of biological diversity and ecological functions that are scientifically managed to provide economic and social benefits to present and future generations of Tanzanians.”

CHAPTER THREE

3.0 MATERIALS AND METHODS

3.1 Theoretical framework

3.1.1 Overview of Sustainable Livelihood Approach (SLA)

The study was designed from theoretical framework of Sustainable Livelihood Approach (SLA) which has been used since the late 1990s as development intervention and formed a central concept of the UK's Department for International Development's (DFID) strategy during the early years of the New Labour government in the UK (Morse et al, 2009). The call for emphasis on sustainable livelihoods was set out in the 1997 White Paper on international development as follows: refocus our international development efforts on the elimination of poverty and encouragement of economic growth which benefits the poor. We will do this through support for international sustainable development targets and policies that create sustainable livelihoods for poor people, promote human development and conserve the environment (DFID, 1997). According to Chambers and Conway (1992) a livelihood comprises the capabilities, assets (stores, resources, claims and access) and activities required for a means of living; a livelihood is sustainable which can cope with and recover from stress and shocks, maintain or enhance its capabilities and assets, and provide sustainable livelihood opportunities for the next generation; and which contributes net benefits to other livelihoods at the local and global levels and in the short and long-term. The theory takes much concern on assets of sustainable livelihood where people depend on those assets/capitals for their daily survival. Scoones (1998) identified five capitals of sustainable livelihood which were *Natural capital* (natural resource stocks (soil, water, air, genetic resources) and environmental services (hydrological cycle, pollution sinks), *Human capital* (skills, knowledge, labour includes good health and physical capability), *Economic or financial capital* (cash, credit/debt, savings, and other

economic assets), *Physical capital* (infrastructure (buildings, roads), production equipment and technologies) and *Social capital* (networks, social claims, social relations, affiliations, associations).

3.1.2 The application of sustainable livelihood theory to peri-urban wetland ecosystem.

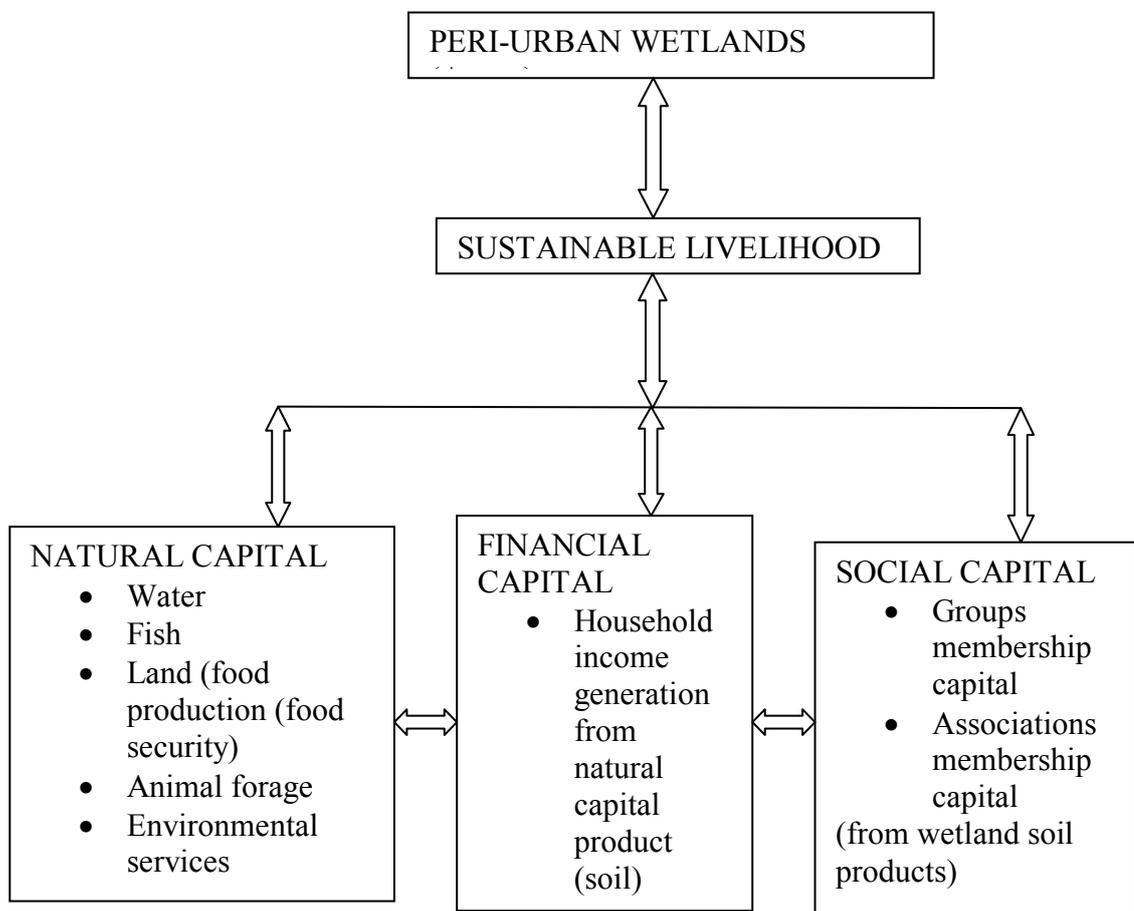


Figure 1: Theoretical framework for sustainable livelihood analysis of peri-urban wetland assets/capital. Source: Author construct with much contribution from The UK's DFID Sustainable Livelihoods framework (DFID 1997).

There is inter-link between Peri – urban wetlands which act as the major asset with sustainable livelihood of communities living adjacent to wetland landscapes. Such inter-relationship connected with three capitals which were usefully to the objectives of the study where by peri-urban wetland offered those of three capitals which assuring sustainable livelihood of local communities who utilized these small wetlands. The three capitals were natural capital which offer (water, fish, land for food production, animal forage and environmental services), financial capital (household income generated from natural capital product (soil) and social capital (group membership and association membership capital from wetland soil products) (Fig. 1).

Furthermore basing on objectives of the study there was a close inter- link between three capitals by which natural capital in term of land capital which utilized for food production and then ensuring food security to the livelihood of local communities who utilize peri-urban wetland. The excess foods that are produced lead to generation of household income and that financial capital turn back also to the production of food. Financial capital facilitates formation of social capital which leads the formation of groups and association memberships. Social capital in other side facilitates back to financial capital and natural capital (ensuring food security) of the local communities. At the end those three capitals influenced sustainable livelihood of local communities and the existing of peri-urban wetland at all.

3.2 Description of the Study Area

3.2.1 Geographical Location

Shinyanga Municipality is one of the districts of the Shinyanga Region of Tanzania. It is bordered to the north by the Mwanza Region, to the south by the Shinyanga Rural District, to the east by the Kishapu District, and to the west by the Kahama District and the District

lies between latitude $3^{\circ} 20'$ and $3^{\circ} 45'$ South of the Equator and longitude $33^{\circ} 20'$ and $35^{\circ} 35'$ East of the Greenwich Meridian (URT, 2013). The study was conducted in four villages of Mwalugoye, Old shinyanga, Chamaguha and Mwangala (Fig. 2).

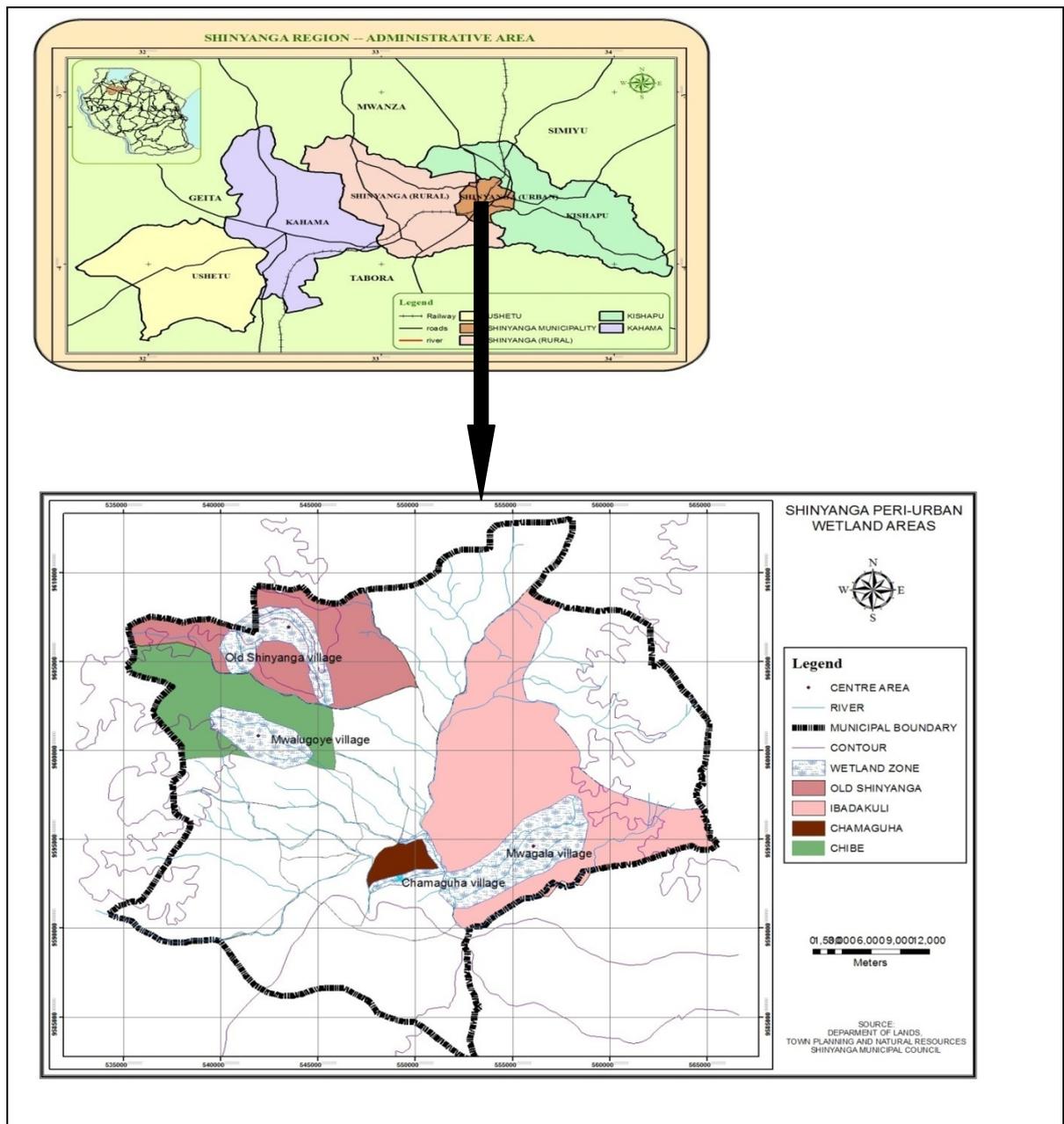


Figure 2: A map of Shinyanga Municipal Council showing the study villages of

Mwalugoye, Old Shinyanga, Chamaguha and Mwangala.

Source: Department of Lands, Town Planning and Natural Resources Shinyanga Municipal Council

3.2.2 Administration

The District covers total area of about 548 square kilometres which is about 1.1% of the total area square of Shinyanga region (URT, 2007). Administrative the District has about 3 divisions and 17wards19 Villages, 25 Mitaa and 95 Hamlets. Topographical area is flat lowland with small hills in the West and North West. The District has a gentle slope in the South, East and in the North. The Municipality area is divided into two main parts, the urban properly covering 25 square kilometres and the rural area with 523 square kilometres. The rural part of the district covers 95.4 percent of the total land area while the urban proper covers the remaining 4.6 percent (Shinyanga Municipal Profile, 2014)

3.2.3 Population

The council has a population of 161 391 people as provided by the 2012 Population Census and Housing report of which 78 655 were males and 82,736 were females with an average house hold of 4.8 persons (URT, 2013). The projected population for 2013 is estimated to be 165 749 based on inter-census annual growth rate of 2.7%.

3.2.4 Climate

Generally the Municipality experiences a tropical type of climate which is characterized by two seasons which is the rain season having two peak seasons, the one that starts in October and ends in December of the same year, and again it starts in March the following year coming to an end in April or early May. Dry season has two peak seasons, the one that starts in May to Mid-October of the same year and again January to February of the following year (Shinyanga Municipal Profile, 2014).Total average rainfall per annum ranges between 600 – 1000mm(URT, 2007).Maximum average temperature ranges between 20⁰C to 31⁰C and minimum temperatures averages between 18⁰C to 24⁰C.

3.2.5 Vegetation and soil

In early 1920s Shinyanga was extensively forested with Acacia and miombo species and forest products and services were available (Malcolm, 1953). But now days the vegetation is mainly of acacias bush with *panicum* and *Chlorisgayana* as the main grass species. Natural legumes like tropical kudzu are sparsely distributed in the grazing land. The soil is clay although in some areas clay –loam soils are observed (Shinyanga Municipal Profile, 2014).

3.2.6 Social economic activities

The major activities in the district are Agriculture, livestock keeping, industries, mining and business. The food crops which grown are maize, sorghum, paddy, sweet potatoes, millet and cassava and to some extent, cotton is also cultivated as a cash crop in the study area (NBS, 2002). Livestock kept are mainly cattle, goats, sheep, donkey, pigs and poultry (URT, 2007). The main ethnic group of the study area is the Wasukuma.

3.3 Sampling Procedures

Purposive sampling was applied to select wards which have wetlands because not all wards in Shinyanga Municipal have wetlands. The selected wards were sampled using simple random sampling to get four wards. Then within these four wards purposive sampling was applied again to get villages which have wetlands because not all villages which are within four wards have wetlands. The villages which have wetlands were sampled using simple random sampling to get four villages where the study was conducted. The four sampled villages were selected purposely based on accessibility and proximity to the wetland.

The selected villages were Mwalugoye, Old shinyanga, Chamaguha and Mwangala. Households were taken as sampling units where by 30 households were selected randomly in each village to get total sample size of 120. The 30 households were taken as sampling units in each four villages because the nature of study required doing so, because the study focused on households who own land in wetlands and upland and in village registers there was no data for number of households who own land in wetlands and uplands. Thus 30 households were selected randomly in each village to get total sample size of 120 which is considered as adequate number to fulfill the requirements of efficiency, reliability and representativeness (Kothari, 2010). Also purposive sampling was conducted to get farmer groups/associations which utilize wetland farmland from four selected villages. There were about 36 groups/associations which involves in wetland agriculture in four villages where for each village there were 9 groups/associations. From 9 groups/associations, 5 groups/associations were randomly sampled to represent the whole sample size in each village, therefore to get a sample size of 20 groups/associations for four villages which were Mwalugoye, Old Shinyanga, Chamaguha and Mwangala.

3.4 Data Collection

Secondary data and primary data were collected for this study. The secondary data sources obtained from journals, books, records from Web resources, Sokoine National Agriculture Library (SNAL) and Regional and Municipal Agricultural, Planning and Natural resources offices. The primary data were collected to fill the gap of whatever was not found from secondary data. The primary data were obtained through field observations, questionnaires (face to face interviews), focus group discussion (FGD) using checklists of probe questions and key informants interviews at district level. The process of collecting data involved a number of steps that were reconnaissance survey, questionnaire survey, focus group discussion, key informant interviews and participant field observation.

a) Reconnaissance survey

This was done so as to get the whole picture of research site. This stage involved visiting wetland farms, selection of sample units, and pre-testing questionnaires. During this survey, five households from each of the identified villages were randomly selected and interviewed to pre-test the questionnaire so as to check reliability and validity of the questions. Some corrections were made to meet the research objectives. This was done also for farmer groups/associations where one group/association was randomly selected and interviewed from each identified villages.

b) Questionnaire survey

Questionnaire forms were administered for each household sampling unit and farmer groups/associations (Appendix 1 and 2). Interviews were face-to-face where the researcher had to reach the respondents at their homes and sometime to their farmland in the time when head of household was in the farm. Questionnaire was made to acquire information from heads of households regarding the contribution of wetland products to household's income and food security. The information included among others household social economic characteristics, amount of food produced in wetland agricultural crops and upland agricultural crops, total size of the wetland farm and cash money earned from wetland agricultural products and upland agricultural products. Unit price per bag/tenga was estimated by using (Tshs) and converted into US\$. Types and amounts of different foods produced or harvested was measured using units familiar to local people such as "*debe*", "*kopo*", "*tengas*" etc. and those units were converted into standard units (kgs). For appendix 2 interviews was face-to-face to the groups/associations members. Each groups/associations organized and agreed the right place to meet. Questionnaire was made

to acquire information from each group/association regarding the benefits received by members who utilize the wetlands through groups/associations.

c) Key informants

A checklist was designed to lead the interviews with key informants who are knowledgeable on wetland and upland agricultural activity (Appendix 3). These included District Agriculture Officer, District Natural Resources Officer and District Planning Officer. The information required, included common period of food shortage as well as food availability, general social and economic characteristics of well-being of households in the district in terms of source of income, food, occupation, management of wetland by government and accessibility of the wetlands to adjacent communities.

d) Participant field observation

Field observations by the researcher are very important because they help the researcher to compare the information given by respondents and the actual situation in field (Kajembe and Wiersum, 1998). The information collected included general condition of crop farming, size of wetland farmland and types of food grown in the wetlands and uplands.

e) Focus group discussion

This tool of collecting data was also applied because it provides different information from different types of well knowledgeable persons. This method involved the use of a checklist (Appendix 4) to facilitate discussions. Focus groups involved Ward/Village Executive Officers, Ward/Village Extension Officers, Environment Committee leaders, Village Committees, men and women, elders, middle aged, youth and famous people in the village. Each village had 10 participants for group discussion. Information discussed included; types of food crops grown in wetlands, factors affecting wetland crop production, crop calendar for crops cultivated in wetlands and types of food crops grown in the wetlands.

Others were common period of food shortage and coping strategies for food shortage and strategies to conserve wetlands sustainably.

3.5 Data Analysis

3.5.1 Content analysis

The PRA data such as participant observation was analyzed by content analysis. In this regard, the recorded dialogues were broken down and put into meaningful argument and conclusions were made. Data from focus group discussions and key informants were analyzed with assistance of people in the field. The focus group discussion and key informants data were presented in illusive form. Those data were used to add information to questionnaire tool.

3.5.2 Questionnaire data

Statistical Package for Social Sciences (SPSS) Software was used for descriptive statistics and Excel for windows software. The descriptive statistical analysis was included arithmetic mean, standard deviation, frequencies and percentages. The t-test was used in order to compare both mean value of household cash income and amounts of foods obtained from wetland fields and upland fields. Correlation test was used to test group/association formed factors in term of (registration and average income per member) against wetland utilization benefits in term of (Government support and food security) respectively.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1 Socio-economic Characteristics of Sampled Household Respondents

The main socio-economic characteristics that were taken into consideration were gender, age, marital status, education level, main economic activities, household size and residence duration (Table 1).

4.1.1 Gender and age

From the proportion of respondents interviewed the results show that about 72.5% were males and 27.5% were females. This means that males are the majority as household heads because the study was considered heads of household. It has been argued that with African society's traditions in most case males will appear as household heads (Bwana, 1996; Magembe, 2007). Gender relations are a major factor in respect to household activities with a connotation on household production and income. It was observed that both male and female contribute to the family income and assuring food security through wetland agricultural activities.

The proportion of respondents with age group 39-60 was 54.2% followed by age group of 18-38 (29.2%). This indicated that most of people in surveyed area were energetic enough to contribute in agriculture production in wetlands farming. The age distribution of a society determines to a large extent the potential productive force in a society. It has been argued that household members are considered economically productive at the age of 16 to 64 years (Mtenga 1999). Also according to Ishengoma (1998) the respondents aged over 60 years rarely participate in production activities especially in agriculture probably because they are considered as unfit in offering workforce.

4.1.2 Marital status

About 75%, of the respondents were married couples and only a few (4.2%), were single while 6.6% were separated 10.8% widowed and 3.3%. divorced. These results concur well with the Tanzania Bureau of statistics 2014 that more than 50% of Tanzania Mainland adult persons are married given the fact that married couples have more mouths to feed. The utilization of wetlands to produce food and income to feed the family will likely increase with increasing number of married couples. The fact that majority of the respondents are married the utilization intensity of the wetlands is expected to be high.

4.1.3 Education level

The education level of the respondents is showed in Table 1. Most of the respondent attained primary education (57.5%). The proportion of those with secondary education (14.2%), tertiary education (3.3%) and adult education (3.3%) was relatively low. Also 21.7% of the respondents had no any formal education. Education has direct influence on people's knowledge and participation in natural resources management and promotes utilization of natural resources. Katani (1999) argued that an increase in education level increases the level of awareness and thereby creating positive attitudes, values and thereby motivating people to manage natural resources in sustainable manner.

Table 1: Socio-economic characteristics of the respondents in study Villages

Category	% of Respondents (n=30)					All (N=120)
	Mwalugoye	Old Shinyanga	Chamaguha	Mwagala		
Gender						
Male	83.3	66.7	76.7	63.3		72.5
Female	16.7	33.3	23.3	36.7		27.5
Age class						
18-38	33.3	36.7	23.3	23.3		29.2
39-60	43.3	50.0	60.0	63.3		54.2
Above 60	23.3	13.3	16.7	13.3		16.7
Marital status						
Single	10.0	3.3	0.0	3.3		4.2
Married	63.3	80.0	83.3	73.3		75.0
Separated	6.7	6.7	6.7	6.7		6.7
Widowed	16.7	6.7	10.0	10.0		10.8
Divorced	3.3	3.3	0.0	6.7		3.3
Education level						
Non formal education	20.0	23.3	23.3	20.0		21.7
Adult education only	0.0	0.0	3.3	10.0		3.3
Primary education	63.3	56.7	50.0	60.0		57.5
Secondary education	16.7	16.7	13.3	10.0		14.2
Tertiary education	0.0	3.3	10.0	0.0		3.3
Main economic activities						
Trading and small business	0.0	13.3	13.3	13.3		10.0
Formal employment	3.3	10.0	6.7	3.3		5.8
Crop farming only	56.7	33.3	36.7	30.0		39.2
Crop farming & livestock keeping	40.0	43.3	43.3	53.3		45.0
Household size						
1-3 persons	20.0	33.3	23.3	10.0		26.7
4-6 persons	36.7	43.3	63.3	67.7		49.2
7-9 persons	36.7	16.7	10.2	16.7		21.7
10-12 person	6.7	6.7	3.3	6.7		2.5
Residence duration						
1-20 years	10.0	6.7	20.0	6.7		10.8
21-40 years	46.7	36.7	23.3	26.7		33.3
41-60 years	30.0	43.3	43.3	53.3		42.5
Above 61	13.3	13.3	13.3	13.3		13.3

Maro (1995) argued that, education plays major role in the socio-economic development of any society and it fosters human creativity and new innovations in natural vegetations management into traditional systems of land use management. Kajembe and Luoga (1996) reported that there is no development without education. The increase in the level of education also increases options of respondents to meet their livelihoods. In this study most of the population had primary education which may entail unsustainable utilization of the wetlands due to poor conservation knowledge. It was observed that most of respondents who completed primary school were much involved in wetland farming compared to those who attained relatively higher education level.

4.1.4 Main economic activities

The main economic activities of the respondents include crop farming, livestock keeping and small business see Table 1. Majority of respondents practiced a combination of crop farming and livestock keeping (45.0%) followed by crop farming only (39.2%). Few respondents were involved in small businesses (10.0%) and formal employment (5.8%). Wetland farming and livestock were the major activity by majority of the population resulting into intensive utilization of wetlands for farming and livestock grazing. Traditionally Wasukuma are agriculturists and livestock keepers in Tanzania. The major food crops that are grown in the study area were paddy, maize, cassava, sweet potatoes, vegetables (such as spinach, amaranthus (mchicha), cabbage) and fruits (such as tomatoes and watermelon). Livestock include cattle and goats. Interviews and participant observations showed that crop production was complemented by other small businesses including selling of agricultural produces such as rice, maize, sweet potatoes, tomatoes and vegetables.

4.1.5 Household size

Majority (49.2%) of households had about 4-6 persons per household followed by 1-3 persons (26.7%), 7-9 persons (21.7) and 10-12 (2.5%) see Table 1. Family size is an important feature for determining the extent to which labour power is needed in food production and income and it reflects household's access to sufficient food, income and other basic needs. Yanda *et al.* (2005) reported that available labour influence wetland productivity. This imply that household with large family sizes are likely to have more labour force enough to utilize effectively wetland resources than small family sizes, although Lorri and Kavishe (1990) argued that big family size contributed to food insecurity in Tanzania.

4.1.6 Residence duration

Majority (42.5%) of the population had long residence of 41-60 years in the area, followed by 21-40 years (33.3%). This indicated that most of wetland farmlands were possessed by indigenous people hence contributing to full utilization of wetland resources for a long period of time.

4.1.7 Location of farmland and land holdings in wetland and upland farmland

About 56.7% of the population owned farmlands in wetlands and uplands thus undertake both wetland and upland cultivation while a good proportion (36.7%) own farms in the wetland. Upland cultivation only was done by a relatively low number of the population (Table 2). This shows that wetland cultivation is undertaken by a substantially high proportion of the population. The high proportion of wetlands utilization comes from the fact that most wetlands are fertile and have adequate availability of water throughout the year which assures more yields. The results resemble those of Majule (2007) who reported

that majority of farmers would have both wetland and upland farmland. This is because both wetland and upland complement each other as an important source of livelihood.

Table 2: Location of farmland and land holdings in wetland and upland farmland in study villages

Item	% of Respondents (n=30)				
	Mwalugoye	Old Shinyanga	Chamaguha	Mwagala	All (N=120)
Location of farmland					
Wetland	20.0	26.7	36.7	36.7	36.7
Upland	10.0	6.7	3.3	6.7	6.7
Both	70.0	66.7	60.0	56.7	56.7
Size of land (wetland)					
0.00	10.0	6.7	3.3	6.7	6.7
Below 0.5ha	6.7	3.3	10.0	6.7	6.7
0.5-1.5ha	26.7	26.7	36.7	46.7	34.2
1.6-2.5ha	20.0	40.0	33.3	33.3	31.7
2.6-3.5ha	16.7	16.7	13.3	6.7	13.4
Above 3.5ha	20.0	6.7	3.3	0.0	7.5
Size of land (upland)					
0.00	20.0	26.7	33.3	33.3	28.3
Below 0.5ha	3.3	10.0	3.3	3.3	5.0
0.5-1.5ha	6.7	6.7	6.7	3.3	5.8
1.6-2.5ha	10.0	10.0	20.0	6.7	11.7
2.6-3.5ha	13.3	6.7	20.0	13.3	13.3
Above 3.5ha	46.7	40.0	16.7	40.0	35.8

Note: **0.00** mean respondents who did not own farms in either wetlands or uplands

Moreover, majority of farmers (65.9%) owned plots of between 0.5 - 2.5ha in wetland areas while in upland areas majority of farmers (35.8%) have a plots of above 3.5ha and also majority (28.3%) of respondents who were surveyed did not have plots in upland areas. Most of respondents have small portions of farms in wetland areas because of huge demand of these farmlands associated with their productivity (Plate 2 and 3). Similar observations by Sarris *et al.* (2006) that smallholder farming in Tanzania is characterized

by an average size of cultivated land of between 1ha and 3ha. During interview with key informants and focus group discussions it was observed that not all members of communities studied have access to wetland farms due to shortage of farmland in wetlands.



Plate 1: A small portion of respondent wetland farmland with paddy planted at Mwalugoye village



Plate 2: A small portion of respondent wetland farmland with water cover prepared for planting paddy at Old Shinyanga village

4.2 Contributions of Peri-urban Wetland Ecosystems to Natural Capital (Land) –

Food Production/Food Security

4.2.1 Types and amount of food crops produced in peri-urban wetlands

Most of communities 79.2% who live adjacent to peri-urban wetland resources depend on the wetlands in obtaining their food for sustaining their livelihoods (Table 3). The major food crops grown in peri-urban wetland farmlands in Shinyanga Municipality are cereal crops (rice and maize), root crops (sweet potatoes and cassava), vegetables (spinach, mchicha, cabbage, green pepper, eggplant, Chinese cabbage) and fruits crops (tomatoes, watermelon and sugarcane). A comparative mean analysis of the crops produced in wetland and upland farm fields showed that production of cereals was the highest followed by fruits and root crops. Vegetable ranked the lowest in production (Table 4).

Table 3: Farmland depended for obtaining food for community livelihood.

Item	Frequency	Percent
Wetland	95	79.2
Both Wetland and Upland	25	20.8
Total	120	100.0

A comparative analysis using T-test showed that mean production levels of cereals, vegetables and fruits were significantly higher in wetlands than uplands ($p < 0.001$). The production of root crops on the other hand was not significantly different between the two sites. These findings are similar to observations by Abort and Hailu (2000), which indicated that 80% of cereals were produced in wetland areas in Illubabor Ethiopia.

Furthermore, during focus group discussions it was stated that wetland crop productivity was affected by various constrains such as lack of appropriate water management especially during dry seasons in each year causing water scarcity among wetland resource users.

Table 4: Comparison of household average amount of food produced from wetland and upland farmland field in study villages

Type of crop		Yield production in Kg			t-test	
		Wetland	Upland	t-value	sig.(2tailed)	
Cereals	Mean	2542.92	392.83	20.98	0.000***	
	Stde	103.97	41.09			
Fruits	Mean	591.00	5.75	9.95	0.000***	
	Stde	59.59	2.15			
Root crop	Mean	308.17	311.50	-1.697	0.092 Ns	
	Stde	39.75	40.79			
Vegetable	Mean	203.21	2.79	7.89	0.000***	
	Stde	25.33	0.70			

Key:

*** =Significant at $P \leq 0.001$

Ns = Not significant at $P \geq 0.05$

It was observed that, people in the study area depended largely on rice and maize as their main staple foods. Rice varieties grown in the area included hybrids such as “*Katani*”, “*Kahogo*”, “*Omana*” and “*Super*”. Sugar cane is also grown in Mwalugoye and Old Shinyanga villages as one of the commercial crops contributing significantly to household income. Vegetables and fruits are grown especially during dry seasons after harvesting paddy and during that time people rely on nearest river Mhumbu as a water source for the case of Chamaguha and Mwangala villages.

4.2.2 Contribution of wetland cultivation to household food availability

The use of wetlands ensures food supply throughout the year for majority of the adjacent communities. About 75% of the adjacent population produces food from the wetland fields all the year round. A small proportion produces food for at least 3 up to six months a year (Table 5). Vegetables, sweet potatoes and fruits are produced throughout the year while most cereals (paddy and maize) are produced for only six month and root crops are for

three months. Sweet potatoes are the major crop grown in large quantities in both wetland and upland farm fields.

During focus group discussion it was reported that the months where households experience food shortage were from October – February and during this times most of households depended on root crops especially sweet potatoes which were preserved after the period of harvesting (michembe) for reducing household food shortage.

Table 5: Periods of Production of Different Crops in a Year in peri-urban wetlands in the study area

Time length	Frequency	Percent
Three months	6	5.0
Six months	24	20.0
All around the year	90	75.0
Total	120	100.0

4.3 Contribution of Peri-urban Wetlands to Financial Capital - Household Income

The mean annual household income contributed by agriculture production in wetlands amounted to Tshs of 1 114 583.33 (US\$ 557) from paddy, Tshs 849 500 (US\$ 425) from fruits and Tshs 214 583.33 (US\$ 107) from vegetables and Tshs 157 185 (US\$ 79) from maize. This makes a total mean value annual income of Tshs 2 335 852 (US\$ 1168) (Table 6). During focus group discussion it was reported that paddy production gives farmers high income because its production is also high compared to other crops and the market for paddy is available.

A comparative analysis of production in wetlands and uplands using t-test show a significantly higher ($P \leq 0.001$) household income from wetland cultivation than upland

cultivation for paddy, vegetables and fruits production (Table 6). The reasons behind such differences could be explained by the fact that most respondents invest more in wetlands than upland because of availability of more fertile soil and adequate water in wetland areas. This proposition is in resemblance with the study carried out in Sri Lanka by Nagabhatla *et al.* (2006) which indicated that farmers prefer to use wetlands due to fertile agricultural land and ability to control the water (moisture).

Another study conducted by Yanda *et al.* (2005) in Singida reported similar reason that farmers utilize wetlands for rice cultivation because of high yields and high soil fertility, which in turn contributed substantially to household cash income. Moreover there was no statistically significant difference for cash income generated from maize productions between wetlands and upland farmlands because the cash income generated from maize crop is relative higher in both sites.

Table 6: Comparisons of average total cash income earned from wetland and upland agricultural products in study villages.

Type of crop	Mean value in Tshs		Test statistic	
	Wetland	Upland	t-value	Significance
Paddy/rice	1 114 583.33	73 666.67	7.783	0.000***
Maize	157 185.00	118 558.33	1.748	0.083Ns
Vegetables	214 583.33	0.00	7.177	0.000***
Fruit crops	849 500.00	5 250.00	5.523	0.000***

Key:

***=Significance at $P \leq 0.001$ Ns= Not Significance at $P \geq 0.05$

4.4 Social Capital Benefits Accruing from Utilization of Wetlands

There are substantial social capital benefits that accrue from utilization of wetlands. These include associations (formal/informal) formed around the utilization of wetlands. There

are 36 farmer groups/associations that have been formed in the four villages of Mwalugoye, Old Shinyanga, Chamaguha and Mwagala. About 75% of 20 sampled groups/associations generate income from wetlands farming, credits/microfinance (15%), salary/wages (5%) and investment/business (5%) (Fig. 3). Wetland production therefore makes a major and substantial income earner farmer's group/association members. According to group members paddy produced from wetlands generates the highest income compared to the other crops.

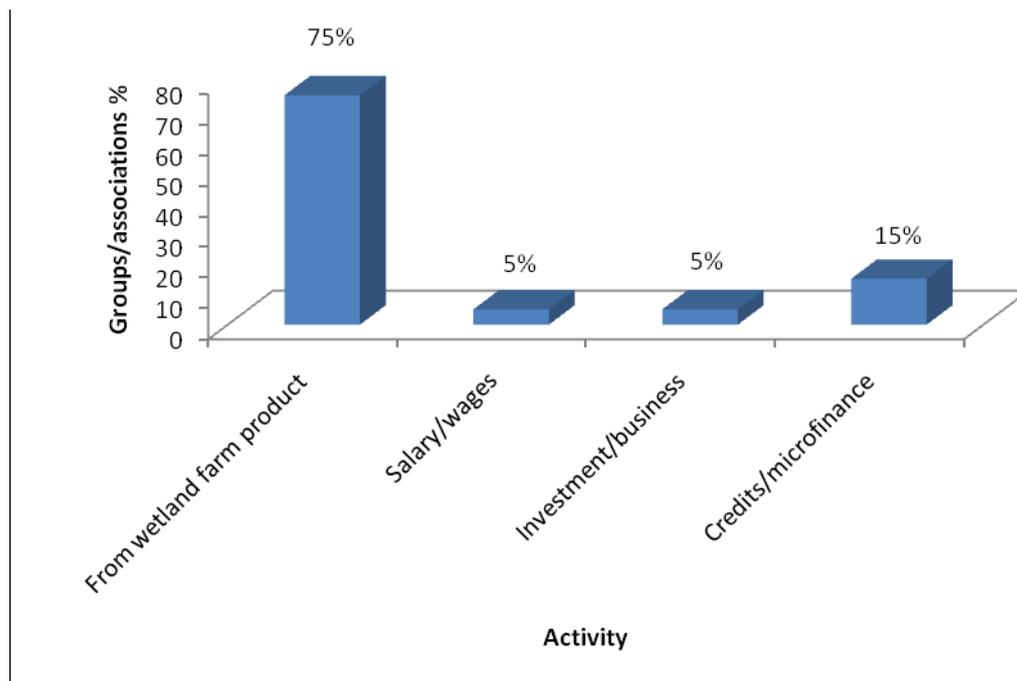


Figure 3: Main source of income for group/association members in study villages

4.4.1 Benefits received by farmer groups/associations

In Fig. 4 shows the benefits farmer groups receive from being members of particular associations. Such benefits include access to loans/credits (70%), followed by access to agriculture inputs (10%) and access to agricultural extension services (5%). This implies formation of farmers in groups/associations is related to benefits that would not be available without the associations. Loans received from within associations (Table 7)

support agricultural activities through hiring farmland, buying agricultural inputs and paying farm labourer.

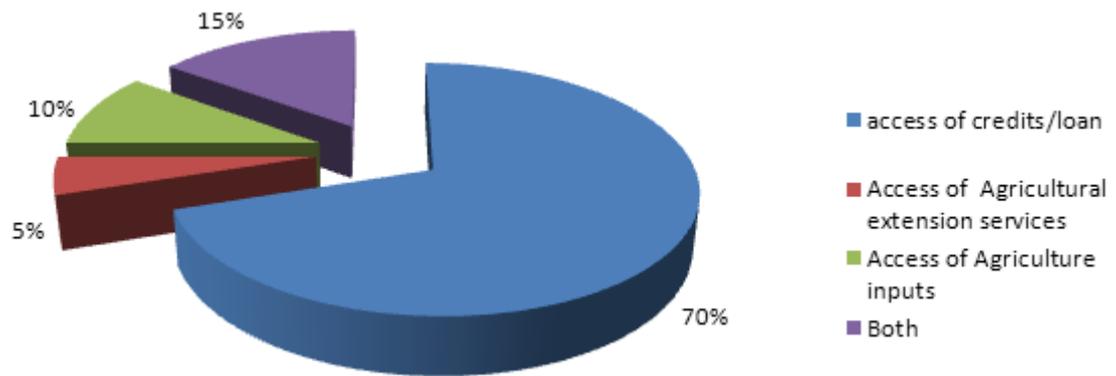


Figure 4: Benefits received by wetland farmer's group/association members in study villages

Table 7: Sources of loans for farmers group/associations in study villages

Item	Frequency	Percent
Within the Group/Association	14	70.0
Banks	1	5.0
Small loan institutions	3	15.0
Both	2	10.0
Total	20	100.0

4.4.2 Relationship between registration of groups/associations and government supports

In this benefit a correlation test was used to measure relationship between groups/association registration and government supports. Non-parametric bivariate correlation analysis showed a significant positive correlation between groups/associations registration and government support ($r = 0.681$, $P = 0.01$) which means that groups/associations which were registered by government received more government supports in various aspects such as agricultural inputs (power tillers, water pump, pesticides, seeds and incentive fertilizers), adequate agricultural extension services and

small to medium size loans. This is because farmers who organised themselves into registered groups use more effectively the benefits from the municipal compared the unregistered groups.

4.4.3 Relationships between average income per group/association members and food security in their households

There was significant positive correlation between average income per group member and food security ($r = 0.862$, $P = 0.01$). This means that members of groups who had higher average income were more food secure throughout the year. This implies that higher income from wetland agricultural crops contribute to household food security among group members. Most of farmers in groups depend on rice crop production as their main source of income and food. The income farmer's groups/association generate is used to buy food hence ensuring food security in their household.

CHAPTER FIVE

5.0 CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

Peri –urban wetlands contribute substantially to household food security through production of various agricultural crops which grow well in wetland areas.

Peri-urban wetlands contribute substantial household income through selling of crops produced in wetlands.

Farmer associations formed around wetland utilization obtain substantial benefits associated with social capital including loans/credit facilities and various forms of government support.

5.2 Recommendations

On the basis of research study results the following recommendations are proposed:

- i. Wise use activities for ensuring wetland catchment management through promoting tree planting, ecotourism and upland rice cultivation activities.
- ii. Wetland friendly investments and environmental conservation such as sustainable farming practices, biodiversity conservation and sustainable animal grazing in wetland areas.
- iii. Alternative non consumptive income generating activity such as beekeeping and sustainable fishing should be encouraged.

- iv. Further studies and monitoring on the benefit received by groups/association formed around utilization of wetland farmlands are important.

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APPENDICES

Appendix 1: Questionnaire for Household's survey –Shinyanga Municipality

Questionnaire No..... Date of interview.....

Part A: Location

Division:

Ward:

Village:

Part B: Socio-economic characteristics of Household

1. Respondent status; (a) Head of Household (b) member of household ()

Gender	Age (years)	Marital status	Education level	Number of dependants		
				Male	Female	Total
1=Male	1= Below	1= Single	1= Non formal			
2=	18	2= Married	education			
Female	2= 18- 38	3= Separated	2= Adult education			
	3= 39- 60	4= Widowed	only			
	4= Above	5= Divorced	3= Primary			
	60		education			
			4= Secondary			
			education			
			5= College			
			6= University			

2. What is your main economic activity?
 - a) Trading and small business { }
 - b) Formal employment { }
 - c) Crop farming only { }
 - d) Livestock keeping only { }
 - e) Crop farming and livestock keeping { }
 - f) Other specify.....
3. How long have you lived in this village? (Years).....
4. Where is the farmland?
 - a) Wetland
 - b) Upland
 - c) Both
5. What is the total size of your farmland? (Ha)
 - a) Wetland.....
 - b) Upland.....
6. What is your total household income per annum?

Part C: Wetland ecosystems to household food security

7. Where do you depend much on obtaining food for your livelihood?
 - a) Wetland b) upland c) both

8. What foods do you commonly produce/consume in your household?

Wetland	Upland	Food Crops	Source	Explanation
		Staples		1: own produce 2: purchase from market 3: both own produce and purchase 4: other (Specify)
		Maize		
		Rice		
		Cassava		
		Sweet potatoes		
		Relishes		
		Vegetables		
		Fish		
		Beans		
		Game meat		
		Others (Specify)		

9. What are the types of wetland crops do you produce?

Crops	Main purpose of production		
	Cash	HH Consumption	Both
Rice			
Maize			
Sugar cane			
Vegetables			
fruits			
Sweet potatoes			
Cassava			
Beans			
Others (specify)			

10. Quantity (**Kg**) of particular crop produced

Type of food	Wetland	Upland	Total	Unit price per bag/tenga (Tsh)
Cereals				
Maize				
Rice				
Root crops				
Cassava				
Sweet potatoes				
Vegetables				
Spinach				
Mchicha				
Cabbage				
Chinese				
Others				
Fruits				
Tomatoes				
Pumpkins				
Onions				
Watermelon				
Sugarcane				
Others				
Beans				
Fish				

11. For how long do you rely on the foods from wetland?

- a) One month (season)
- b) Three month (season)
- c) Six month (season)
- d) All year round (season)

12. Which months of the year you normally experience food shortage in your Household?

13. What do you normally do to cope with the food shortage situation? Tick the appropriate answers

Copping strategy	
Sell assets and buy food	
Food support from government	
Support from relatives	
Skipping meals	
Reduce expenditure on non food needs	
Reduce food consumption	
Sell labour	
Changing diet	
Other (specify)	

Part D: Wetland ecosystems to household income generation

14. How much cash income do you generate from various activities/products of wetland?

Activity/product	Cash income (Tsh)	Activity/product	Cash income (Tsh)
Wetland activities		Non- wetland activities	
Brick making		Stone crushing	
Firewood collection		Business	
Grazing/animal fodder collection		Employment	
Herbal activities (traditional medicine)		Upland crop farming	
Beekeeping		Rice	
Fruit collection		Maize	
Fishing		Sugarcane	
Thatching grass		Vegetables	
Weaving material		Sweet potatoes	
Handcraft		Tomatoes	
Wetland Crop farming		Other (specify)	
Rice			
Maize			
Sugarcane			
Vegetables			
Sweet potatoes			
Tomatoes			
Other (specify)			

15. What are other sources of income apart from wetland products based activities?

(not in 14 above)

16. What are the other main sources of income in your household?

- a) Salary/wages
- b) Investment/business
- c) Credits/microfinance
- d) Non

Appendix 2: Questionnaire for farmer groups/associations

Village..... Date.....

1. Name of Group/Association.....
2. How many members in the group/association?
 - 0.1 Male..... 0.2 Female.....
3. When was your group/association formed? (Year)
4. Is your group registered by government?
5. If yes when your group/association was registered?
6. What was the purpose of forming the groups/associations
Related to wetland utilization (farmers/traders)
7. Do all members possess farm field in the wetlands?
8. If yes what is the average size of wetland field a group member possesses in term of Ha or number of plots?
9. What wetland products do you get?
10. What is the total annual average income per group/group member? (Tsh)
.....
11. What are the benefits received by group member when he/she join in the group?
12. Have you experience food shortage in your household?
 - a) If yes what strategies you use to tackle this problem.....
 - b) If no why so?
13. What are the main sources of income of group members
 - a) From wetland farm products
 - b) Salary/wages
 - c) Investment/business
 - d) Credits/microfinance

14. Where do you get credits/loan?

- a) From the Group/association you form
- b) Banks
- c) Small loan institutions

15. What are the purposes of loan you apply for?

16. Do governments support your group/association?

**Appendix 3: Checklist for key informants: Municipal Natural Resources Officer,
Municipal Planning Officer and Municipal Agricultural Development
Officer**

Date.....

1. Name.....
2. Title.....
3. District.....
4. For how long have you been in the District?
5. Which products do people obtain from wetlands?
6. Which are the main wetland products based activities people do?
7. What other activities people do apart from wetland products based activities?
8. What are major food and cash crops grown in wetland? (arrange in ranking)
0.1..... 0.2..... 0.3.....
9. What is the total annual average income per household? (In Tsh)
 - i. From wetlands agriculture products.....
 - ii. From uplands agriculture products.....
10. What could be a reason for people to cultivate in the wetlands?
0.1..... 0.2..... 0.3.....
11. Do people experience food shortage in this area? Yes ----- No -----
12. If yes what are the coping strategies applied by people?
13. Which season do people depend on wetland agricultural products?
14. Are wetlands valued by District level Governance?
 - a) If yes, why and how?
 - b) If no, what could be reason?
15. What is the average size of wetland a household can hold in terms of ?
0.1 Ha 0.2 number of plots

16. Are these wetlands reserved or open access?

17. If open access, are they accessible to all members of the community?

0.1 Yes [] 0.2 No []

18. Give reasons

If yes what supports do government provided to you?

Appendix 4: Checklist for Focus Group Discussions (FGD)

Are all members of communities accessible to wetland resources?

0.1 Yes

0.2 No

1. If no, what are the reasons?
2. Which products do people obtain from wetlands?
3. Which are the main wetland products based activities people do?
4. What could be the reasons people to depend on wetlands for their livelihood?
5. What are the types of food crops grown in the wetlands?
6. What are the factors affecting wetland crop productivity?
 - 0.1 lack of capital
 - 0.2 lack of appropriate water management
 - 0.3 water logging
 - 0.4 Prolonged drought
 - 0.5 Other (specify).....
7. Which season do people depend on wetland products/crops
8. Do people experience food shortage in this area?
9. If yes which months and what are the coping strategies applied by people?
.....
10. Are wetlands valued by District level of Governance?
 - c) If yes, why and how?
 - d) If no, what could be reason?
11. Can you suggest some strategies on how wetlands can be conserved sustainably so that can continue to benefit you?