CLIMATE SMART LIVELIHOODS FOR COMMUNITY-BASED ADAPTATION TO CLIMATE CHANGE IN YALA WETLANDS, KENYA

FINAL PROJECT REPORT

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Table of Contents

Summary of outcomes

- GeoCLIM software acquired and successfully used to assess spatio-temporal climatic trends of rainfall and temperature for in Siaya where Yala wetland is located.
- 3 training manuals for community trainings on climate smart livelihoods produced i.e. agroforestry and climate change, water harvesting and climate change, sustainable farming and climate change.
- 62 local community members comprising 35 male and 27 female trained and their capacity built on climate smart livelihoods. These included a total of 12 youths comprising 9 males and three females.
- Local knowledge on climate change acquired through participatory techniques e.g. PRA and FGD and attended by community members. The information included among others historical climatic events, local climate manifestations, traditional weather forecasting, effects of climatic changes on local livelihoods, community climate copying strategies.
- Climate change awareness created among 342 community members and school children with meetings conducted in local schools (two primary and two secondary).
- Community exchange visit conducted between Yala wetland community and Tanga Kona commercial village where the community learnt practical production of drought resistant cassava and sweet potato.
- Six selected farmers supported with cassava and sweet potato seeds for local production at Yala wetland with harvesting expected in July and November.

Introduction

Yala is a complex of freshwater wetlands with active human socio-economic activities practised by the local communities living adjacent to the wetlands. This is despite its status as a designated Important Bird Area (IBA) and Biodiversity Significant Area (BSA). It provides crucial ecosystem goods and services to the generally poor (58-68%) riparian communities and its biodiversity. The wetland is affected negatively by various challenges. Climate change has been blamed as one of the key challenges facing the wetland hence affecting biodiversity, habitats and human livelihoods that are derived from the wetland. High population densities and poverty rates have rendered the area as a climate change hotspot in the Lake Victoria region. In Kenya for example, climate change impacts pose inherent risks among the local population and natural resources through increased droughts, floods and mudslides, and economic losses in agriculture, energy and infrastructure.

The communities occupying Yala wetlands are traditionally dependent on these wetlands for small-holder subsistence farming with low external input use and land productivity. The communities are also affected by declining soil fertility and massive rural-urban migration of the energetic youth. There is potential risk of climate change impacts that are accelerated by anthropogenic threats from unsustainable agriculture, overharvesting of papyrus, human settlement, burning, sand harvesting and poaching, accelerating local poverty and food insecurity. This is worsened by retrogressive local peoples' behaviour, attitudes, ignorance, and a lack of an effective adaptation strategy that incorporates awareness creation and community-level education.

The Arcos Small Grants provided funding for a project that would address some of the challenges faced by communities in the Yala wetlands. The project is entitled "Climate Smart Livelihoods for Community-based Adaptation to Climate Change in Yala Wetlands, Kenya". This report presents the preliminary results of the activities conducted to implement the project objectives in Yala wetlands.

Project objectives

The Goal of this project is to promote climate smart and ecosystem friendly livelihoods for climate change adaptation among grass-root level communities through participative research in Yala wetlands. Specific objectives are to:

- Assess the effects, coping strategies and local knowledge on Climate Change
- Promote the adoption of climate smart and ecosystem friendly sustainable livelihoods through community participation
- Undertake Climate Change education and awareness to build local community and institutional capacities

Project activities

1. Use GeoCLIM to assess spatial & temporal changes in climate variables (rainfall and temperature)
2. Assess local climate copying strategies and knowledge using FGD and PRA
3. Climate change education & awareness – schools and community drama & puppetry outreaches for attitude change

4. Production of livelihoods training manuals: agroforestry, sustainable farming and water harvesting
5. Community trainings on the climate-smart livelihoods, i.e. agroforestry, sustainable farming and water harvesting
6. Pilot implementation of climate smart livelihood

Methodology

GeoCLIM was used to analyse and produce trends from climatic data. GeoCLIM software is designed for climatological analysis of historical rainfall and temperature data. It was developed by Tamuka Magadzire of USGS FEWS NET in support of the USAID PREPARED and Global Climate Change activities. It provides non-scientists with an array of accessible analysis tools for climate-smart agricultural development. The GeoCLIM software was obtained from the Regional Center for Mapping of Resources for Development (RMCRD). Both rainfall and temperature data were also obtained from the RMCRD. Expert analysis was conducted on the data in two steps i.e. extraction of grid statistics from GeoCLIM and generation of trends from grid statistics. Temperature and rainfall statistics were extracted for each month was aggregated into sum and average computed for each year i.e. the sum from January-December for each year such as 1981 and divided by 12 (number of months), eventually resulting into average totals for each year. The totals are listed against the year and graphs are generated using trend tools in excel and a linear equation is inserted.

Participatory Rural Appraisal (PRA) and focus group discussions (FGD) were used during community climate change surveys. The PRA tools used included community calendars, risk mapping, transect walks, resilience ranking and adaptation attributes. Methods used to collect data included group work, field visits during transect walks, participatory mapping and photography among others. Local community members were invited to attend community meetings at Yala wetlands in Hawinga centre. Care was taken so that all groups were represented in the FGD including the youth, women, the elderly and the middle aged males and females. Similar questions were asked per group. Through triangulation method, the results were integrated to come up with a common answer following analysis of comments from the enumerators.

Three livelihoods training manuals on agroforestry, water harvesting and climate smart farming were developed to train community members on the three livelihoods. The training manuals were developed following the advice of experts from respective county government departments. Information in the manual was collected by reviewing published literature. Prior to this, local training needs were assessed from the local communities through a rapid survey with regard to the three livelihoods. Trainers were invited from the county ministry of agriculture and forestry department to conduct community trainings and demonstrations at village level.

A one day learning exchange visit was organised for Yala wetland community members to Tanga Kona commercial village in Busia County in March 2016. Plenary presentations and was conducted by Tanga Kona commercial village representatives followed by practical demonstrations at farm level in selected farms. 4 farms were visited, two for cassava and two for sweet potato. Sample cassava and potato seed cuttings were purchased for selected farmers for trials in Yala. Cultivation of the crops is ongoing since April and harvesting of sweet potatoes expected end of July while first harvest of Cassava expected in November.

Participatory drama performances followed participatory education theatre model where storyline of the episodes will be open-ended to allow audience participation and facilitator will act us the bridge between performers and audience to enable discussion for purposes of learning and enabling desired change and action. The drama and puppetry performances were showcased in a variety of locations, including schools, churches, markets, strategic streets and beaches, to ensure the messages reach a broad-range of the population. The participatory drama and puppetry outreaches were used because it is a powerful tool for behaviour change communication and awareness creation. It uses cultural appropriate storytelling by taking examples from local heritage, language and cultural symbols. As a result the messages are more easily accepted and owned by the target audiences. Additionally it is entertaining, provocative, and non-intrusive, and causes individuals and the collective to reflect on their current actions and how they can be changed. Using drama and puppetry to educate communities around the Yala Swamp on climate change would help contextualize the messages to be easily understood and hopefully provoke the need to act.

Results and Discussion

Spatio-temporal changes in climate variables

The results below show that average rainfall for Siaya had two peaks: 1998/9 and 1997. These years also correspond with high peaks in temperature (Fig. 1 and 2). The latest peak (1997) could be attributable to the el-nino rains in Kenya during that period. However, Siaya County has received reducing average rainfall for the last couple of years.

Local knowledge on climate change

The history of the community revealed that their naming was based on historical events and the early use of available resources that influenced various aspects including migration and permanent settlement. It was also clear that the community members are aware of their surroundings based on their active participation in participatory mapping of hazards, boundaries, physical features and local institutions. Community calendars revealed that traditional timings and duration of occurrences of various events have changed indicating climatic changes e.g. flood, drought, locust infestations, hunting etc. Most people are also engaged in new activities that were never practiced in the past indicating adaptation and use of local coping mechanisms to the changing climate.

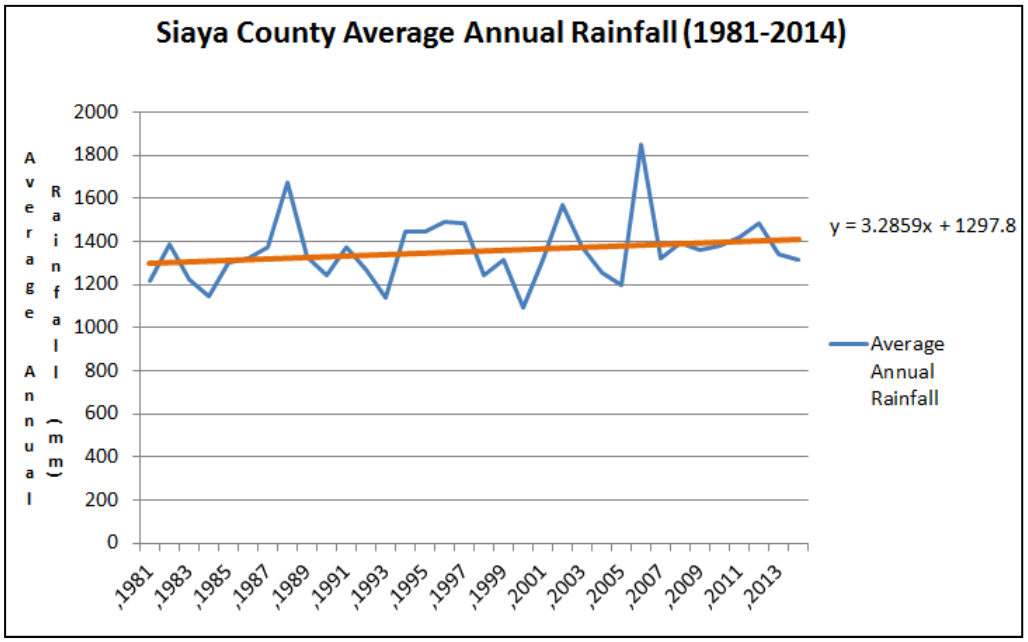

Fig. 1: Average annual rainfall trends in Siaya County (1981-2014)

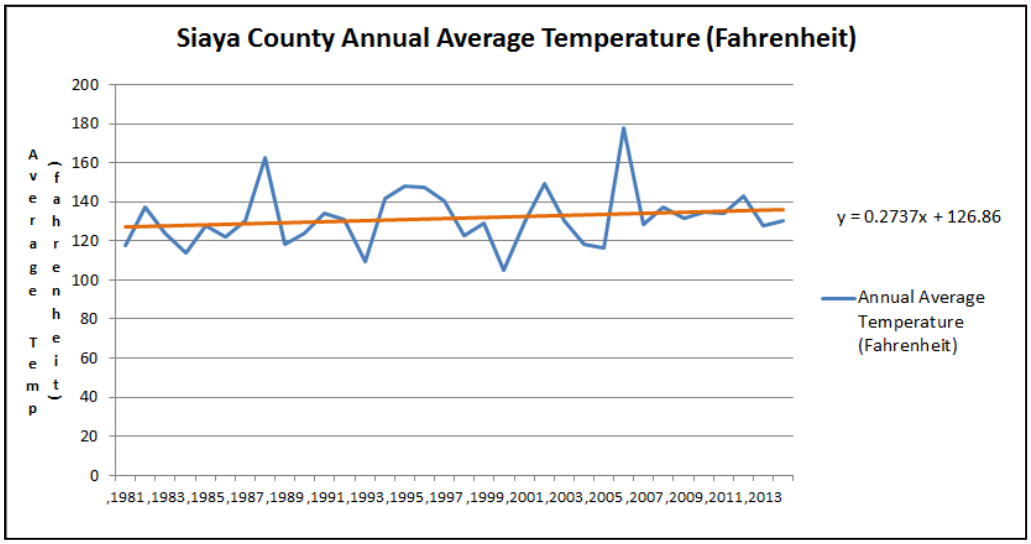

Fig. 2: Average annual temperature trend in Siaya County (1981-2014)

The community grouped individuals and homesteads based on their wealth and capacity to respond to disasters into four categories: the wealthy, the rich, the poor and the needy although their percentage composition varies across the villages in Yala wetlands. The PRA also revealed weak adaptation mechanisms to climate change and variability mainly due to lack of local capacities and preparedness in obtaining services e.g. inadequate and poor infrastructure, food insecurity, lack of equity, poor communication flow, weak capacities in trainings, lack of awareness creation in climate related issues etc. During FGDs the community mentioned the following sources of climate information to be in use at the local level: announcements on the radio, experiencing the effects of climate change and seeing climatic changes and weather variations happening.

The community revealed that in the past there was plenty of flooding water in the wetland but today human activities, mainly destruction of wetland vegetation like papyrus and prolonged drought has created many dry patches within the wetland areas. This has contributed to increased human activities in the wetland e.g. crop farming, grazing and wanton harvesting of papyrus vegetation. However, various livelihood groups revealed that climatic changes have impacted negatively on their activities in various ways.

Climatic events that the community could recall

- 1961 – The *Ouru* rains: demolished bridges, killed people, destroyed property and eroded land into Lake Victoria
- 1971 – Lake Victoria had shrunk because of a prolonged drought which was then followed by floods which brought a lot of mosquitoes that killed a lot of livestock and destroyed property
- 1994 – Widespread famine because of prolonged drought
- 1995 – Drought which caused livestock mortalities
- 2007 – *El Nino* rains which destroyed property
- 1980 – widespread supply of yellow maize as a result of drought
- 1998 – Flooding which also caused the swelling of River Nzoia
- 2015 – Flooding, which destroyed roads and property

One of the PRA sessions with community members

Community knowledge on indicators/manifestations of climate change

- Prolonged period of heavy rainfall indicates an oncoming period of drought
- Strong winds plus high temperatures are an indication of potential drought
- Crops that were doing well in the past are now not doing well
- Cold spells at strange or abnormal times
- Change in water temperature in the lake
- Increase in intensity of the sun's heat
- Drought - high temperatures with no/little rainfall
- Unpredictable rainfall and rainfall forecasts
- Phragmites (locally known as *odundu*) was there in plenty in the past but is not there anymore, the remaining few face stunted growth
- Papyrus reeds grow shorter than normal height at maturity
- *Typha* grass growing and replacing papyrus reeds.

Methods of local weather Forecasting

- Mist (*ong'weng'o*) indicates drought
- Heavy presence of African open bill stork (*ogonglo)* and African white stork *(ogungo*) indicates the onset of a rainy season
- Lung fish (*kamongo*) gasping out for air – sign of onset of rain
- Many stars in the sky at night – drought
- Frogs croaking – rain
- A lot of dew in the morning – drought
- A lot of safari ants (*morno*) – rain
- Increase in water temperature in the lake – Rain
- Increase in atmospheric temperature – Rain
- Sea breeze blowing – Rain
- Land breeze blowing – drought
- Thunderstorm in the western side in the morning – rain
- Thunder and cold in July – rain
- Spotting a shadow of the moon in milk when milking in the morning – coming of a new moon (Rain)
- Rainbow - it is not going to rain
- Direction of blowing wind. North to south – Rain and East to West – no rain.

Local weather forecasting methods still being used

- Heavy presence of particular bird species e.g. African open billed stork and African white stork indicate the onset of a rainy season
- Frogs croaking – rain
- Sea breeze blowing – Rain and land breeze blowing – drought
- Direction of blowing wind. North to south – Rain and East to West – no rain.

Effect of climatic changes on local livelihoods

Crop farmers

- Floods destroy and wash away crops in farms located near the lake shores

- Disruption of planting seasons due to climatic variations leading to unpredictable seasons. As a result, months of harvesting and planting have changed
- Increased soil erosion and surface runoff removes fertile top soil affecting crops growth and health
- Increased land infertility leading to poor harvests. For example, the locals have witnessed poor cassava harvests probably because the soils have become shallow due to loss of top soil
- Most soils have become saline probably due to change in pH. This has resulted in increasing presence of harmful soil microbes
- Intensity of the sun has increased causing high temperatures which has resulted in increased presence of certain insects e.g. mosquitoes which in turn increases the spread of diseases like malaria
- Increased human-wildlife conflicts whereby wild animals destroy crops and attack human beings e.g. monkeys, wild pigs, *Sitatunga* antelope, snakes, squirrels etc.

Livestock keepers

- Increased livestock diseases e.g. *nagana*, foot and mouth disease etc.
- Milk production by livestock has also reduced immensely
- Inadequate pasture during drought
- Increased poultry diseases

Ecofinder Kenya staff leading one of the FGDs in Yala wetlands

Mat weavers

- Increased burning of papyrus reeds hence lack of raw materials for mat making
- Flooding leads to overgrowth of papyrus hence lack of accessibility to mature papyrus areas

- Increasing temperatures leads to increased growth of *Typha* grass resulting into stunted growth of papyrus reeds

Fishermen

- Decrease in fish stocks in the Lake Kanyaboli and adjacent lakes and wetlands
- Quality of fish caught has reduced as a result of water pollution
- Water pollution in the lake has led to migration of fish from the lake into streams and rivers in search for fresh water
- Loss of fishing grounds and fish breeding areas
- Decreasing lake depth as a result of siltation has resulted into fish mortality

Drought conditions with associated high temperatures have led to increased incidence of malaria as a result of mosquitoes. Waterborne diseases are also associated with flooding conditions. one of the participants reiterated that '*in the past, the species of bedbugs that was there was easily gotten rid of by simple household application of hot water but recently there is a new breed that one must buy expensive drugs to be able to get rid of'* indicating change in local conditions.

Local strategies for coping with climate change

- ❖ Changing planting methods e.g. use of inorganic fertilizers
- ❖ Digging trenches around farms to reduce flooding in farms
- ❖ Rainwater harvesting in plastic tanks for use during the dry seasons
- ❖ Availability of community health workers (CHW) who respond during disease outbreaks at the village level
- ❖ Buying and using mosquito nets to control malaria at household level
- ❖ Alternative livelihoods e.g. fish farming, establishment of tree nurseries, small scale businesses etc.
- ❖ Engaging in more than one type of livelihood (livelihood diversification)
- ❖ Tree planting to control soil erosion, improve soil fertility, and sale of tree products e.g. fruits, poles, timber etc.
- ❖ Attending capacity building, awareness creation and training workshops on using recommended seeds and farming techniques
- ❖ Planting faster maturing crops
- ❖ Using agrochemicals to manage crop diseases
- ❖ Irrigation farming e.g. small-scale irrigation water pumps like money maker water pump, digging water drainage trenches around the farms to drain water from farms
- ❖ Immunizing children to fight diseases e.g. TB, Polio, Tetanus etc.

Despite the use of the above mechanisms to cope with climate change at the community level, the community is still faced with many challenges e.g.

- ❖ Lack of technological knowhow and inaccessibility of tools for modern farming e.g. irrigation
- ❖ Inadequate finances to acquire equipment e.g. generators to pump water
- ❖ Overpopulation which leads to a family person having too many dependants which also results into inadequate disposable income to help in dealing with climate change.

- ❖ Lack of adequate knowledge on what should be done to help deal with climate change.

Community trainings on climate smart livelihoods

In total, 62 local community participants successfully completed the three days training held in various villages. These included 35 male and 27 female participants respectively, while a total of 12 youths comprising 9 males and three females also participated. The training was an eye-opener and laid the foundation for implementation of a pilot livelihood project in one of the participating villages. It was agreed that the trained community participants would use the knowledge acquired in their routine livelihood activities and act as change agents both at household and community levels. The training was successful with the majority indicating to have learnt much from the topics covered and vowing to disseminate the same in their respective villages. There was a general recommendation to increase the overall training duration, increase the number of villages covered by the project and increase the scope of training topics for wider coverage.

Community members participationg in a PRA exercise

Awareness creation on climate change

Four participatory drama and outreaches were conducted in Yala wetlands and its environs covering various topics in climate change awareness and adaptation. A total of 342 community members and pupils participated in the meetings as indicated in the table below. Out of these two outreaches were conducted in four

schools: Barolengo and Hawinga secondary schools, and Sidundo and Uhembo primary schools.

Practical demonstration on tree nursery establishment during community trainings in Yala

Summary of climate change awareness activities implemented in Yala wetlands

No	Topic	Venue and time	Target audience
1.	Local manifestations, causes and Impacts of Climate Change	Barolengo secondary school, 13 March 2016, 3pm-6pm	Primary school pupils and their parents representing various families in the community. No. of participants: 113
2.	Appropriate interventions and coping strategies to Climate Change	Sidundo primary school, 14 March 2016, 4-6pm	General public and community members. No. of participants: approx. 74
3.	The case of Sustainable Farming and Agroforestry	Hawinga Girls Secondary school, 15 March 2016, 10am-1pm	Secondary school pupils. No. of participants: 87
4.	Climate change adaptation strategies for water harvesting	Uhembo primary school, 16 March 2016, 4pm-6pm	General public and community members. No. of participants: 68

Pilot implementation of climate smart livelihoods

A total of 16 community members from across the three villages were selected and participated in the one day community exchange visit to Tanga Kona commercial village. The objectives of the visit were to; share experience and skills in implementation of various livelihoods at community level, identify challenges and learn lessons in implementing community-driven livelihood activities, and acquire knowledge and skills to guide the pilot implementation of climate smart farming at farm level. The host village has successfully undertaken the following activities:

- Production of cassava and sweet potatoes
- Value addition on cassava and sweet potatoes
- Marketing of farm produce by linking farmers to buyers of both raw farm produce and value added products
- Provision and marketing of certified cassava and sweet potato seeds from selected farmers
- Participation in research and extension through partnerships with research institutions
- Organising and participating in farmers field days with support from willing partners e.g. Farm Concern International

Community members visiting one of the sweet potato farms near Yala wetlands

Cassava and sweet potatoes are promoted by Tanga Kona village as a climate smart farming strategy due to the following reasons:

- Both crops are hardy species that can withstand hash climatic conditions arising from climate variability and change i.e. drought resistant.
- The species require very limited input since they are hardy hence their production is affordable by community members.

- The leaves of certain varieties of cassava and sweet potatoes can be used as vegetables hence providing alternative source of food during drought or famine.
- Orange flesh (Kabode) and Kenspot 5 sweet potatoes varieties promoted by the group have better carotene and vitamin A contents for improved nutrition of children and adults.
- MH95/0183 Cassava variety is locally promoted and it is the most preferred variety because of it is high yielding and fast maturing.
- When grown in large scale the two crops provide higher returns in comparison to sugarcane that is locally grown as the major cash crop.

Lessons learned

- Networking and sharing of ideas among community members, local groups and institutions is critical for sustainability of local projects. Through collaborations and partnership, financial and in-kind support is possible from national and international organisations.
- Communities should be encouraged to start small and grow big with time. Through this they are in a good position to build on their challenges and learn from their mistakes, which they can build on to achieve greater success.
- Local organisations and community groups should have their own land legally acquired to undertake various livelihood activities. Through this they may have legal rights of ownership and set up demonstration plots for community trainings and expansion of livelihood activities.
- There are multiple benefits associated with production and value addition of selected climate smart crops, which are drought resistant. These include among others improved nutrition, food security, improved income and proactive local governance through local committees and group organograms.
- Community members can develop interest on implementing livelihood activities from practical lessons and experiences from other community members implementing a similar or related activity. This was evident after many community members developed interest and reiterated their willingness to engage in the same when they go back home. Similar community exchange programmes should be organised in future.

The community members supported the replication of the production of cassava and sweet potatoes in Yala. Both cassava and sweet potato seed cuttings were purchased by Ecofinder for pilot cultivation in Yala by selected farmers. Two farms (each for cassava and sweet potato) per village measuring approx. 1 acre each were identified and planted with the crops in April. First harvest of sweet potato is expected in July while that of cassava is expected in November 2016.

Conclusion and Recommendations

The results of this study give a clear picture of the effect of climate change on local livelihoods. The local communities are aware of the changes that have been occurring within their vicinity hence having a direct impact on their lives. However, the coping strategies employed by the community are inadequate to address all the challenges. There is need to build the capacity of these communities in order to effectively respond to climatic changes.

In order to improve the capacity to help the local people adapt to the changing climatic conditions we recommend the following:

1. Enhance the capacity of local organizations working with communities to create awareness and support local governments/authorities implement laws and policies that help to reduce community risks to climate change but promote climate adaptation
2. Build the capacity of local groups and community members in networking, group dynamics/governance, fundraising and proposal development and implementation.
3. Support communities to develop and adopt infrastructure facilities that prevent damage caused by climate disasters e.g. construction of flood-resistant toilets to improve sanitation in flood-prone areas
4. Promote the use of traditional knowledge or traditional adaptation practices and integrate them with science-based climate adaptation