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Full Length Research Paper

The role of development projects in strengthening community-based adaptation strategies: the case of Uluguru mountains Agricultural development project (UMADEP)-Morogoro-Tanzania

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This study was trying to find out whether the designing and implementation of the Uluguru Mountain Agricultural Development Project (UMADEP) has taken into account the hazards, impacts and risks associated with climate change and the local coping strategies of their project beneficiaries, since its inception, 17 years ago . Data were gathered using the Community-based Risk Screening–Adaptation and Livelihoods (CRiSTAL) tool, complemented with a series of semi-structured and structured interviews containing both close and open-ended questions. The Vulnerability and Capacity Assessment (VCA) method was also used in identifying resources, capacities and vulnerabilities which pertained to different livelihood settings in the study area. The study found out that coping strategies applied by affected people in the study area vary from one community to the other, depending on level of education, income, household size and agro-ecological zone. Ranking of the identified livelihood resources revealed that natural resources are very crucial in adapting to climate change. Generally, the results indicate a moderate influence of project activities towards enhancing adaptive capacities of the surrounding communities, with the observed positivity of the project activities towards community-based adaptation being more of a coincidence than a planned state-of-affairs. Lack of training to development project officers, managers and planners on the importance of integrating climate change management during the early stages of project development was clearly depicted as a key hindrance to mainstreaming climate change into development planning.

Key words: Climate change, Community-based adaptation strategies, Development projects

INTRODUCTION

Background Information

Climate change is today considered one of the major threats for sustainable development in Tanzania and the rest of the world. It influences health, infrastructure, settlements, food security and agriculture, forests and marine ecosystems. In the United Nations Framework Convention for Climate Change (UNFCCC), adopted in 1992, the International community agreed on mitigation and adaptation as the two basic strategies to deal with climate change. These two strategies are complimentary and non-exclusive (IPCC, 2001).

The Intergovernmental Panel on Climate Change (IPCC), in its Fourth Assessment Report, concluded that the globally averaged surface temperatures increased 0.74 ± 0.2°C between 1906 and 2005 (IPCC, 2007). This trend is expected to persist, with a 1.8 to 4°C warming predicted for the current century. Warming will vary by region and be accompanied by

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significant changes in local precipitation, sea level rise and changes in the frequency and intensity of some extreme events. Yet these impacts will not be distributed or felt uniformly, as those with the least resources have the least capacity to adapt and are the most vulnerable (IPCC, 2007). However, one region of the places on earth where the effects of climate change are being felt particularly hard is Africa. Because of low economic development and institutional capacities, African countries are likely among the most vulnerable to the impacts of climate change (IPCC, 2001). The negative impacts associated with climate change are also compounded by many other factors, including widespread poverty, human diseases, and high population density, which is estimated to double the demand for food, water, and livestock forage within the next 30 years (Davidson et al., 2003). Therefore, climate change impacts have the potential to undermine and even, undo progress made in improving the socio-economic well-being in Tanzania.

The adverse impacts of climate change are already having their toll in the livelihoods of people and in the sectors of the economy in Tanzania. Frequent and severe droughts in many parts of the country are being felt with their associated consequences on food production and water scarcity among others. The severe droughts in 2005 which hit most parts of the country leading to severe food shortages, food insecurity, water scarcity, hunger and acute shortage of power signify the vulnerability of the country to the impacts of climate change. Predictions show that the mean daily temperature will rise by $3^{o}C–5^{o}C$ throughout the country and the mean annual temperature by $2^{o}C–4^{o}C$ (URT, 2005). There will also be an increase in rainfall in some parts while other parts will experience decreased rainfall. Predictions further show that areas with bimodal rainfall pattern will experience increased rainfall of 5% – 45% and those with unimodal rainfall pattern will experience decreased rainfall of 5%–15% (URT, 2005). All these changes will aggravate the situation leading to increased vulnerability of the communities to the impacts of climate change and also affecting the sectors of the economy, particularly agriculture, water, energy, health and forestry.

Livelihoods and climate change

Climate change is and will still be impacting natural and human systems to alter the productivity, diversity and functions of many ecosystems and livelihoods around the world. For poor natural resource-dependent communities, climate change may compound existing vulnerabilities. Settlement on marginal or unstable lands already heightens exposure to climate hazards. Heavy dependence on ecosystem services places their welfare at the mercy of climatic conditions. As the availability and quality of natural resources decline, so does the security of their livelihoods. Watson et al. (1997) concluded that limited resources and capacities for responding to stresses such as droughts constrain the ability of poor communities to meet basic needs and move out of poverty.

Problem statement and rationale of the study

With climate change impacts already being observed in Tanzania, there is an urgent need for adaptive response measures (URT, 2003). This must start with actions that reduce current vulnerabilities and increase adaptive capacities so that local communities can face the longer-term impacts of climate change. The fourth Principal of the United Nations Framework Convention on Climate Change (UNFCCC) states that, “The Parties have a right to, and should, promote sustainable development. Policies and measures to protect the climate system against human-induced change should be appropriate for the specific conditions of each Party and should be integrated with national development programmes, taking into account that economic development is essential for adopting measures to address climate change”.

However, reducing current vulnerabilities and increasing adaptive capacities requires an understanding of how livelihoods are conducted and sustained in a particular community, as the assets and capabilities that comprise peoples’ livelihoods often shape vulnerability and the ability to reduce it. By understanding the dynamics of poor peoples’ livelihoods, one can begin to understand how they will be affected by climate change impacts, how they might respond with the resources they have, what additional resources may be required and how these conditions can be reflected and built upon for successful adaptation strategies.

While it is not always the only risk affecting communities in the developing countries, climate change should nevertheless be considered when designing and implementing a community-level development project, particularly in areas characterized by climate-sensitive and/or natural resource-dependent livelihoods. The onset of longer-term climate change, which will compound existing stresses associated with climate variability, provides yet another incentive for addressing climate risk in a development project. Most projects in Tanzania, however, are not designed with an explicit consideration of climate risks in a community where they operate and how they can affect local livelihoods (RAWG, 2005). Even rarer are projects that take into account the longer-term implications of climate change and how project activities might be affected by the impacts, and/or influence local adaptive capacities and resources that form not only the basis for people’s livelihoods but also the basis for community-based adaptation to climate change.

It should be noted however, that, community-level projects have the potential to influence climate vulnerability and adaptive capacities of vulnerable communities. For example, projects that encourage dependence on a particular technology or crop

species that may be negatively affected by climate change will most likely increase local vulnerabilities to climate change. Conversely, projects that promote resilient crop species, diversified livelihood activities, and risk reduction activities (such as seed banks, food storage facilities, and early warning systems) increase local adaptive capacities.

Therefore, without a keen understanding of some of the local determinants of climate change vulnerability, it is difficult for project planners, officers and managers to design activities that foster adaptation to climate change. This study thus was trying to explore the level at which the designing and implementation of the Uluguru Mountain Agricultural Development Project (UMADEP) has taken into account the hazards, impacts and risks associated with climate change and the local coping strategies of their project beneficiaries, taking into consideration that the project has been there for almost seventeen (17) years now.

OBJECTIVES OF THE STUDY

General objective

This study was trying to find out whether the designing and implementation of the Uluguru Mountain Agricultural Development Project (UMADEP) has taken into account the hazards, impacts and risks associated with climate change and the local coping strategies of their project beneficiaries, bearing in mind that the project has been operating in the area for the last 17 years.

Specific objectives

Identifying the climate hazards and the ensuing impacts in the areas where UMADEP operates.
Identifying the major community-based adaptation strategies to climate change impacts.
To analyze the impact of project activities on key livelihood resources and the identified community-based adaptation strategies.
To recommend to the project management on how to adjust their activities so as to strengthen community-based adaptation

METHODOLOGY

Description of the Uluguru Mountain Agricultural Development Project (UMADEP).

UMADEP was established in 1993 as an integrated project under the Department of Agricultural Education and Extension of Sokoine University of Agriculture. It began working in three divisions namely; Mgeta, Mkuyuni and Mvomero but now it has expanded its geographical coverage to include two more divisions, Matombo and Mlali.
The project is implemented with collaborative efforts between Department of Agricultural Education and Extension of Sokoine University of Agriculture, District Agricultural Development Offices, District Cooperative Office and Farmer Group Networks in the project area. It also collaborates with MVIWATA (The Network of Farmer Groups in Tanzania), INADES Formation, Intermon Oxfam and UMEMCP (Uluguru Mountains Environmental Management and Conservation Project) of CARE International in Tanzania. Through the existing collaborations, UMADEP has an access to technical information which its staff do not have e.g. by hiring a staff from one partner to facilitate a programme which the project has no expert in that specific activity. Other resources like training materials e.g. booklets, fliers are also sometimes obtained from partner organizations.

Project Activities implemented by UMADEP

UMADEP has spent 17 years working in the Uluguru Mountains and the surrounding areas, establishing partnership links developed with local groups to facilitate the identification of constraints to agricultural production and appropriate solutions. Generally, the project has been implementing the following activities in and around the Uluguru Mountains in Morogoro region as summarized in Table 1.

Study site selection

The study was conducted in two divisions out of more than five divisions where UMADEP operates. The divisions are Mkuyuni and Mvomero, representing highland and lowland ecological zones respectively. It was envisaged that whatever the outcomes, this study would serve as a basis for conducting similar studies in other divisions. In addition, there are plans also to replicate this study to other development projects and other regions of Tanzania. However, there was a reason for choosing two different ecological zones, i.e. upland and lowland, and this was to see how different are the impacts of climate change and how do they respond to them with regard to their differentiated resource bases and terrain.

Approaches and methods for data collection

How the information was gathered from the study communities

Most of the data for this study were gathered using the Community-based Risk Screening Tool-Adaptation and Livelihoods (CRiSTAL), complemented with a series of semi-structured and structured interviews containing both close and open-ended questions, administered to the project beneficiaries, project officers and other community members to capture any other information which could not be obtained using CRiSTAL. On top of that, the researchers, together with project planners and

Table 1: Project activities implemented by UMADEP

S/No.	Project Activity
1	Improving agronomic practices for cash and food crops
2	Strengthening of local institutions for good governance
3	Linking small scale producer groups with micro-finance services
4	Diversification of income-generating activities
5	Facilitating market linkages
6	Promotion of conservation agriculture and organic farming practices
7	Promoting household and community food security
8	HIV/AIDS and Gender Mainstreaming

managers gathered information through Vulnerability and Capacity Assessment (VCA) Method. This included specifically the transect walks which involved walking through the communities to observe the people, their surroundings and the resources which comprise their livelihoods. It was the process of seeing the community to note specifically the sites and topography of the study areas and to understand inter-relationships based on space. It was useful in the assessment stage to get an insight of several issues related to livelihoods, vulnerabilities, capacities and resources which exist in the study communities.

In addition, stakeholder consultations, document reviews and internet searching were also very handy in gathering the information. A number of focus group discussions were carried out with local elders and community experts to reveal the trend and intensity of rainfall and other climate variables, and get a gist of how these have been shaping their livelihoods. This was also purposely done to fetch some indigenous technical knowledge on previous onsets of climate extremes and shifts (anomalies) and how they coped with them using the locally available resources.

Description of the Community-based Risk Screening–Adaptation and Livelihoods (CRiSTAL).

CRiSTAL is a decision support tool developed jointly by International Institute for Sustainable Development (IISD), IUCN, SEI-US and Intercooperation. Drawing on the Environmental Impact Assessment (EIA) model and the Sustainable Livelihoods Framework (SLF), CRiSTAL usually provides a logical, user-friendly process to help users better understand the links between climate-related risks, people's livelihoods, and project activities. It is a decision support tool for assessing and enhancing project impacts on local adaptive capacity to climate variability and climate change. CRiSTAL is designed to provide a basis for improving community and project-based decision-making so that adaptation opportunities can be maximized, and maladaptation minimized. It is relevant in project design as well as project evaluation. The tool is organized into two modules, each containing a set of framing questions.

Module 1 of CRiSTAL

The first module is called synthesizing information on climate and livelihoods, which is designed to collect and organize information on the climate and livelihood contexts of the project area, preferably through stakeholder consultations and other participatory methods.

Module 2 of CRiSTAL

The second module, called Planning and Managing Projects for Climate Adaptation, is usually completed by project planners and managers with input from relevant stakeholders. It uses the information from Module 1 to help project planners and managers understand how project activities affect livelihood resources that are either vulnerable to climate risk or important to coping strategies. In doing so, project planners and managers can try to re-design project activities so they maximize opportunities for enhancing adaptive capacities of vulnerable communities as summarized in Figure 1A and 1B.

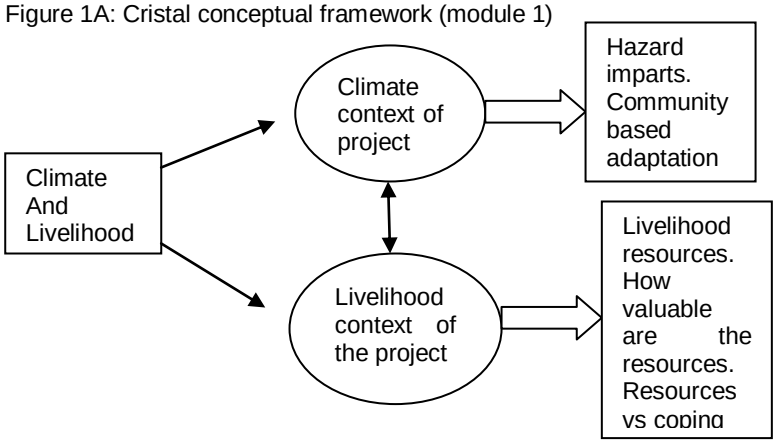
RESULTS AND DISCUSSION

Climate hazards and the associated impacts

The project, (UMADEP) operates in forest, woodland and grassland ecological zones, with the forest ecological zone encompassing very important watersheds, feeding Morogoro, Dar es Salaam and the Coast regions of Tanzania mainland, located mainly in the highlands, alongside the famous Uluguru Mountains in Morogoro region. The woodland and grassland ecological zones are mainly found at the base of the Uluguru Mountains (Lowland ecological area)

The study found out that there has been unusually persistent and prolonged shortage of rainfalls in almost all the areas where UMADEP operates, which have caused serious impacts to the livelihoods. The impacts include crop damage and loss, leading to household food insecurity and loss of savings, loss of trees which provide for food through non timber forest products (NTFPs), water shortages both for household

Figure 1A: Cristal conceptual framework (module 1)

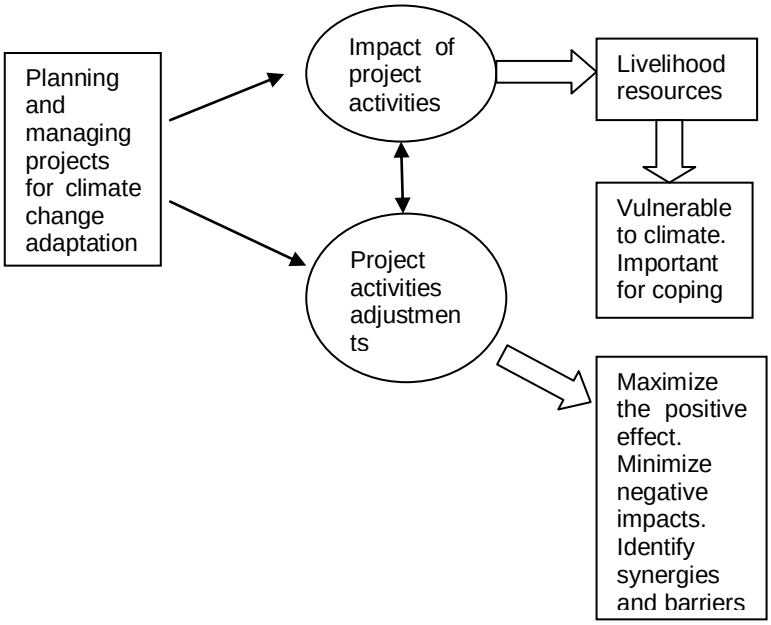


KEY TO THE FIGURE

Livelihood resources

1=Arable land 2=Water wells 3=Forest products 4=Rainwater harvesting systems 5=Wages 6=Remittances 7=Loans and saving facilities 8=Knowledge 9=Skills 10=Farmer groups 11=Trade associations 12=Salaries 13=Wetland systems 14=Surface water delivery systems 15=Pensions

Figure 1B: Cristal conceptual framework (module 2)



consumption (portable water) and for agriculture (crops and animals), resulting into water conflicts and water-borne diseases. Reduced water quality was yet another climate change related impact, resulting again into frequent water-borne diseases.

In addition to and in connection with the drought, wildland fire was another serous hazard which needs immediate attention in the study area. The surrounding forests are increasingly being degraded by fires, with consequent change in vegetation composition. Reasons for these increasing incidences of wild-land fire are largely human but the effects are further compounded by climate change. As the climate gets hotter and drier, the frequency and intensity of forest fires increase.

It has been established that wild-land fires add up into devastating the livelihoods of the communities through burning of the crops and other trees important

for the livelihoods of the communities and chasing of wild animals away from where they could easily be reached by the surrounding communities. Collectively, the ensuing impacts lead into loss of biodiversity, erosion of savings and household food insecurity.

Generally, the study found two dominant climate hazards in all the areas where UMADEP operates. These are prolonged rainfall shortages (drought) and wildland fires as summarized in Figure 2. However, drought was found to be more damaging than the wildland fires. The literature notes that, worldwide, since 1967, drought has been responsible for millions of deaths and has cost hundreds of billions of dollars in damage. A severe drought in Eastern Africa in August 1984 led to widespread famine, killing over 700,000 people during the following year.

Community-based adaptation strategies to climate change impacts.

The coping strategies applied by affected people in the study areas vary from one community to the other, depending on level of education, income, household size and ecological zone.

However, major community-based adaptation strategies associated with the identified climate change impacts were, (i) rainwater harvesting and water rationing, as a response to the dwindling availability of drinking water (for humans and animals) and water for irrigation, also minimizing water-related conflicts. As far as deteriorating water quality is concerned, sieving and treatment of the available water was the most pertinent adaptation strategy available to the communities, keeping the communities away from water-borne diseases. Other coping strategies include diversification of income generating activities, gathering of wild food, food rationing and conservation agriculture which is a response to food shortages, loss of savings, loss of trees and wild animals due to wildland fires as shown in Figure 3. The number that accompanies a particular adaptation strategy denotes the ranking of that particular adaptation strategy by the communities surveyed (Figure 3).

Livelihood resources important for coping with observed climate change impacts

The communities in and around the study areas are endowed with innumerable livelihood resources which were grouped into five major groups namely, Physical, Natural, Financial, Human and Social resources. In each group, there were however the most prominent ones, and are listed as follows. Firstly, arable land, forest products and wetland systems fall under the natural resource category. However, it was noted that wetland systems are vastly distributed in the lowland areas while forest products are key in the highlands. Arable land seemed to be a common physical resource, appearing both in the lowlands and in the highlands as well. Secondly, the communities in the study area rely very much on physical resources, which include water wells (lowland), rainwater harvesting infrastructures (lowland) and surface water delivery systems (highland). In addition, the areas are also endowed with the following financial resources; (i) salaries (ii) wages (iii) loans and saving facilities (lowland and highland) (iv) remittances from their children in cities and towns (Lowland and highland) and (v) Pension. The study also found that human resources in terms of skills and knowledge play an important role in shaping the adaptive capacities of the communities in the study area. The identified human resources in the study area include water management and crop husbandry skills (lowland and upland), which play a leading role in shaping their livelihoods. Lastly, trade associations and farmer groups in both the lowland and highland are very important social capitals helping the communities in coping with climate change impacts. The words in parentheses simply denote where the resource is widely functioning for coping with climate change impacts. Nevertheless, the resources are not only important for coping with climate change impacts, but are also vulnerable to climate change risks. If utilized wisely and sustainably, they can enable the communities adapt to climate change impacts.

Ranking of the identified livelihood resources revealed that natural resources are very crucial in order for communities to adapt to the changing climate, as they ranked 1, 2 and 3. In the same context, financial resources were also found to be key in as far as community-based adaptation is concerned. Table 2 summarizes the key livelihood resources.

Impact of project activities on the livelihoods of project beneficiaries

In this sub-section, the impacts of project activities to the identified livelihood resources and the coping strategies are discussed. It tries to discuss how the project activities foster or constrain the community-based adaptation strategies by impacting on the key livelihood resources which are also vulnerable to climate change risks.

Effects of project activities on important livelihood resources

The impact of project activities to the key livelihood resources has been analyzed. The results show that, although no single activity was found to have a negative impact to the key livelihood resources which were found to be both, important for coping with climate change impacts and vulnerable to the climate change risks, it was realized that most of the project activities assumed a neutral role in terms of fostering climate change adaptation through key livelihood resources. The analysis further showed that at least a third of the key livelihood resources were ill-addressed by the project activities, another third being most addressed, with the last fraction of livelihood resources moderately addressed.

Figure 4 shows the variation of the impacts of project

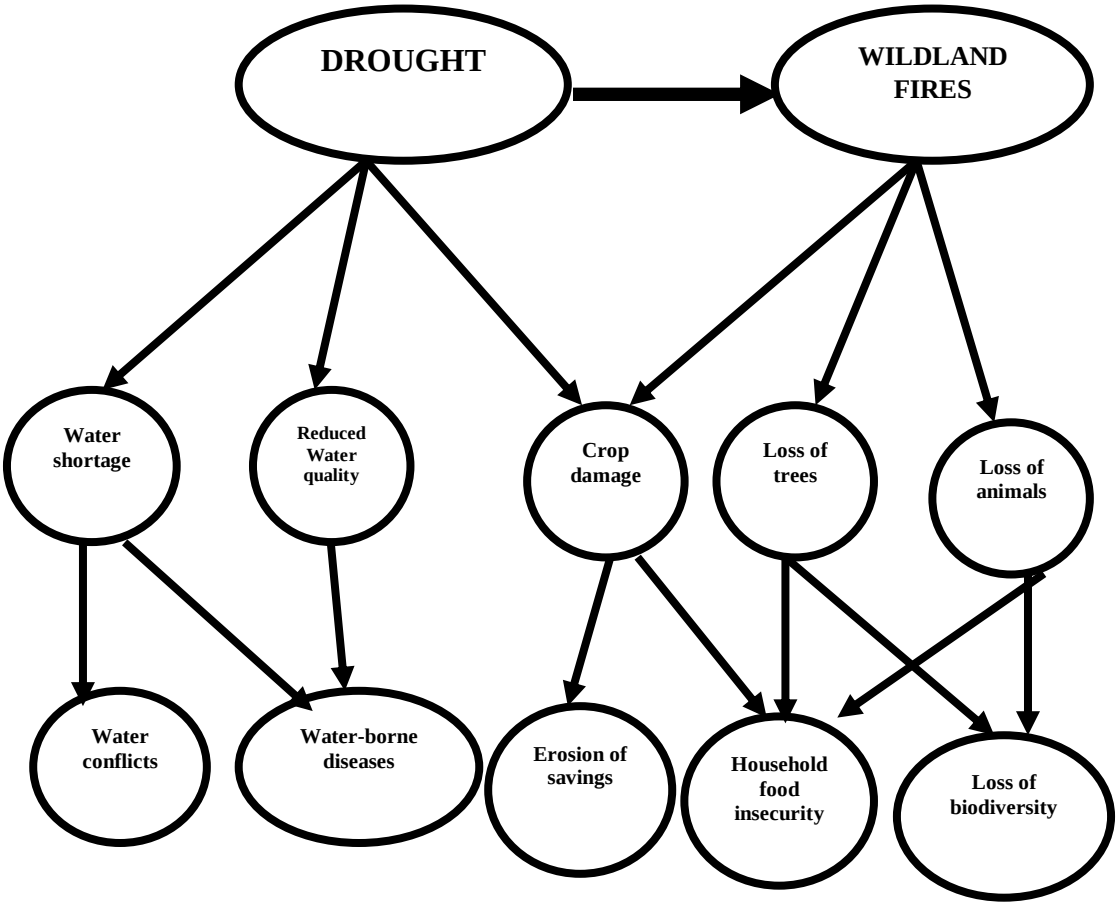


Figure 2: Climate hazards and the ensuing impacts

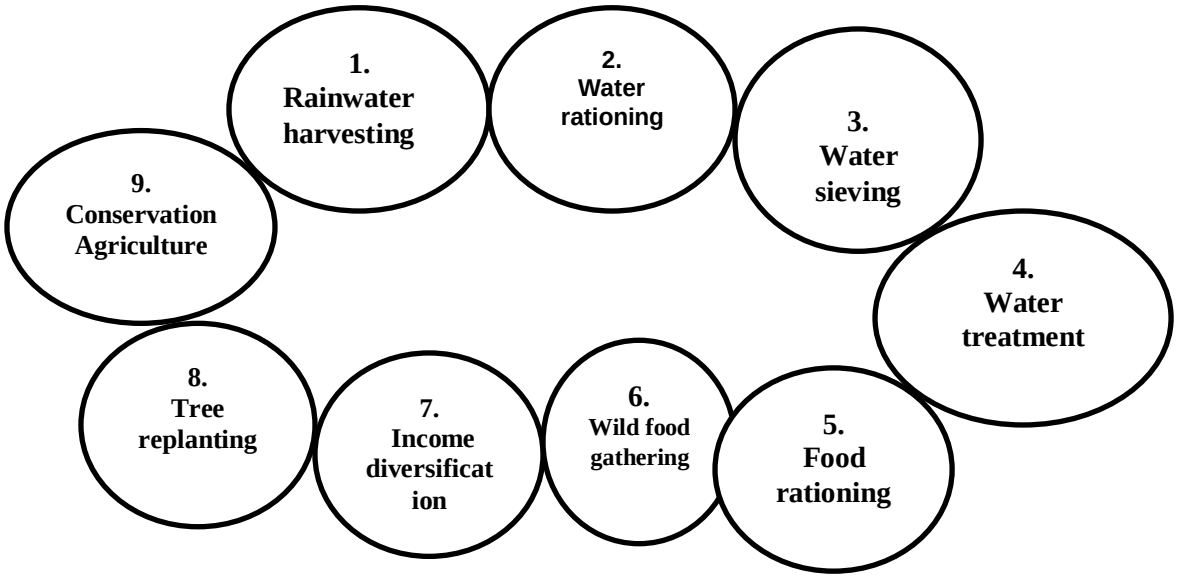


Figure 3: Summary of key community-based adaptation strategies

activities to the key livelihood resources. It indicates how the positive impact of project activities increases with decreasing preference of the resource itself. The dashed trend-line shows the trend of positive impact cases of project activities having a positive gradient, meaning that the positive impact amplifies towards the least ranked livelihood resources. The solid trend-line depicts the neutral impact of project activities

Table 2: Ranking of key livelihood resources

Rank	Livelihood Resource	Key Category
1	Arable land	Natural Resource
2	Water wells	Natural Resource
3	Forest products	Natural Resource
4	Rainwater harvesting systems	Physical Resource
5	Wages	Financial Resource
6	Remittances	Financial Resource
7	Loans and saving facilities	Financial Resource
8	Knowledge	Human Resource
9	skills	Human Resource
10	Farmer groups	Social Capital
11	Trade associations	Social Capital
12	Salaries	Financial Resource
13	Wetland systems	Physical Resource
14	Surface water delivery systems	Physical Resource
15	Pensions	Financial Resource

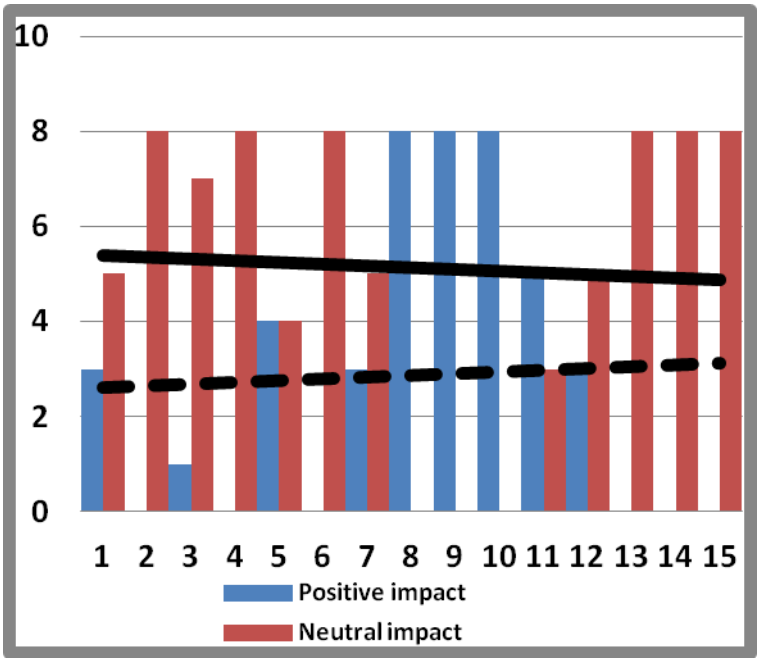


Figure 4: Variation of impacts of project activities to the livelihood resources

Key to the figure

LIVELIHOOD RESOURCES
1=Arable land 2=Water wells 3=Forest products 4=Rainwater harvesting systems
5=Wages 6=Remittances 7=Loans and saving facilities 8=Knowledge 9=Skills
10=Farmer groups 11=Trade associations 12=Salaries 13=Wetland systems
14=Surface water delivery systems 15=Pensions

plummeting as it approaches the least ranked livelihood resource. This means, the higher the preference of the resource in terms of building the adaptive capacities of the community, the lower the impact of the project towards strengthening the adaptive capacities to the project beneficiaries. Generally, the results indicate a moderate influence of project activities towards enhancing adaptive capacities of the surrounding communities, with the observed positivity of the project activities towards community-based adaptation being more of a coincidence than a planned state-of-affairs. Analysis of the reactions of project officers and field officers revealed that nothing like climate change consideration was introduced during the planning phase of the project. This portrays lack of training to

development project officers, managers and planners on the importance of integrating climate change management during the early stages of project development, which would ensure a deliberate move towards underpinning the coping strategies of project beneficiaries and local communities as whole.

Effects of project activities on key adaptation strategies

Figure 5 depicts the trend of impacts of project activities to the key community-based adaptation strategies. While number 1 through 9 under the horizontal axis denotes the ranks of the key adaptation strategies arranged in a descending order, the positive impact of the project activities has been lower to the highly ranked adaptation strategies than to those scored low as indicated by the solid trend-line in Figure 5. The dashed line simply portrays the neutral impact of project activities growing high as it approaches the highly important community-based adaptation strategies.

Although no project activity seemed to undermine any of the key community-based adaptation strategies, the project activities seemed to address few climate change impacts and their ensuing adaptation strategies, leaving the most critical ones like water shortages, deteriorating water quality unaddressed. Income diversification as an adaptation strategy has been over addressed, being covered by 7 out of 8 project activities in all ecological zones, regardless of whether it is a critical problem or not. Most of the project activities play a neutral role to most of the community-based adaptation strategies.

CONCLUSION, CHALLENGES AND RECOMMENDATIONS

Conclusion

The impacts of project activities to the major coping strategies and key livelihood resources have been assessed and the relationships identified. Conclusively, the moderate influence of project activities towards enhancing adaptive capacities of the surrounding communities was more of a chance scenario than a planned state-of-affairs.

Mainstreaming of climate change adaptation into development project planning is still in early stages in most of the developing countries, Tanzania being one of them, as evidenced by the results of this study. If you look at the three levels of adaptation i.e. Autonomous, Reactive and Anticipatory Adaptation strategies, you will realize that the communities around the project area practice a little bit of reactive adaptation, with autonomous adaptation being a key course of action. With the presence of the project, more anticipatory adaptation was expected to be the core course of action, which is not the case as per the findings of this study.

Although the project has invested much into understanding the dynamics of peoples' livelihoods, it did not invest much in understanding how they will be affected by climate change impacts, and how they might respond with the resources they have. This would have enabled them to identify additional resources/interventions which may be required.

Integrating adaptation measures in sectoral and institutional level projects is important to safeguard existing and future development progress in the light of current climate variability and change. The development progress is already being impacted by climate change in semi-arid and tropical regions as well as small island states. Agriculture and water resources are sensitive to climate change, thus climate resilient investments in these sectors are essential in enhancing livelihood opportunities and promote sustainable economic growth. At present, major developmental activities in Tanzania are made in climate sensitive areas highly exposed to droughts and floods without giving due considerations to climate change. It should be noted that, project activities have the potential to strengthen or undermine the efforts directed towards climate change adaptation by the local communities.

Challenges and limitations of the study

Training and climate change knowledge

Lack of training to the development project officers, managers and planners to assist them integrate climate change management during the early stages of project development and low level of climate change knowledge amongst project officers, planners, mangers and project beneficiaries might have influenced the results of this study.

Methodological challenge

Information on persistent and prolonged drought acquired from the communities ought to be backed up by meteorological data, for verbal information alone cannot justify presence of drought. However, inadequate and sparsely situated weather stations could not enable acquisition of realistic rainfall and temperature data in order to analyze drought incidences.

RECOMMENDATION

Various research and planning tools, both structural and non-structural at different decision making levels are available to assess the climate risk in agriculture and water sectors. Such measures have to be implemented to mitigate the adverse impacts of climate change. Development projects should use these measures, which include adjusting the land use practices, introduction of water saving methods through modernization, construction of multi-purpose

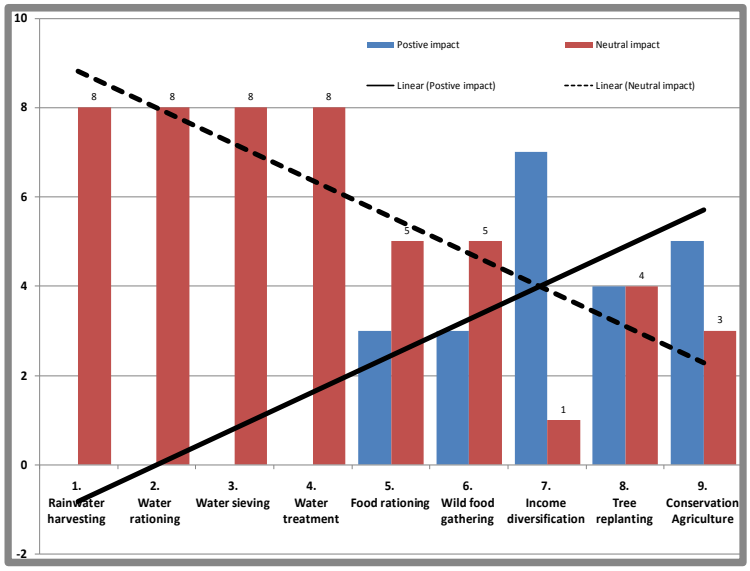


Figure 5: Variation of the impacts of project activities to the community-based adaptation strategies

climate shelters, etc to enhance the adaptive capacities of vulnerable communities. Each of the measures however covers only specific aspects of climate change and is limited to district or region.

In addition, early warning systems, insurance schemes, efficient gender and community participation, which play an important role at all levels should as well be adopted in the very early stages of project planning. To enhance their effectiveness, these measures should be integrated into the development plan of the sectors concerned. This would require that climate risks be systematically taken into account in the designing of new developmental projects, programs and strategies in developing countries.

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