
Prospects and Challenges of Local Community Adaptation to Climate Change in Developing Countries: The Case Study of Malawi

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Abstract

In response to global climatic change and variability, adaptation to climate change has become a widespread global policy goal. It is currently seen as a solution to the likely negative effects of climate change, especially in developing countries. However, adaptation to climate change largely depends on the socio-economic system's adaptive capacity. In the urgency to achieve adaptation to climate change, this question has hardly been adequately explored. This chapter fills this gap by examining the prospects and challenges of community adaptation to climate change in developing countries through the case study of Malawi. The study findings demonstrate that community adaptation to climate change has the potential to stimulate and build productive local livelihood systems.

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However, its success is currently hampered by two things. First, there is lack of clear climate adaptation policy framework to guide community adaptation initiatives. Secondly, the existence of rampant household poverty and low institutional capacity makes it difficult to support community adaptation initiatives. This situation is exacerbated by unstable donor funding toward climate change adaptations. This chapter, therefore, argues that sustainable community adaptation to climate change in developing countries requires improving their social, economic, and institutional capacities.

Keywords

Malawi • Climate change • Local community adaptation • Sustainable livelihoods

Introduction

This chapter undertakes a critical assessment of the developing countries' prospects and challenges of adapting to climate change through the case study of Malawi. The chapter is motivated by the fact that in response to global climatic change and variability, adaptation to climate change has become a widespread global policy goal (UNFCCC 2007; Rohr 2007; UNDP 2007). Simply defined, adaptation is the process of deliberate adjustment in ecological, social, and economic systems in anticipation of, or in response to, actual or expected climate stimuli and effects or stresses (Stringer et al. 2009; Smit and Pilifosova 2001). It is advanced because of its potential to substantially reduce negative climate change impact and stress. Empirical evidence, however, reveals that adaptation to climate change is not automatic. It depends on systems' adaptive capacity and varies among regions, countries, and socioeconomic groups depending on their resource, technology, information, and climate change-related institutional endowments (Burton et al. 1998; Rohr 2007). Equally important, though natural and human systems have spontaneously adapted to climate change for a long time, current climatic change and variability conditions have grossly strained the coping range of the systems leading to greater physical, social, and economic losses (Huq et al. 2003). Thus, current scholarship has highlighted the need for prioritizing planned adaptation to climate change, especially in developing countries. There is increasing evidence that developing countries will bear the most effects of climate change despite contributing less to its causation (Huq et al. 2003; Bie et al. 2008; Burton et al. 1998). Current community climate change adaptation efforts are, therefore, to a greater extent designed and financed by a network of local and international governments and agencies. This trend is largely premised on the argument that local people have low adaptive capacity to climate change and variation (Action Aid 2012; ICIMOD 2012; Smit and Wandel 2006).

However, empirical evidence from a variety of climate change adaptation projects suggests mixed outcomes. While there is on the overall net gains on

national level, net gains on specific local communities and groups are debatable (Actionaid 2006; Labaris 2012; Bie et al. 2008). In particular, studies have highlighted lack of clear understanding of challenges facing local communities in adapting to climate change as a major cause for unimpressive outcomes. This chapter is set to fill in this gap. This study uses Malawi, one of the least developed countries, as a case study to explore this question. Specifically, this study explores Malawi's policy and institutional framework guiding its climate change adaptation initiatives, documents and assesses the effectiveness of major climate change adaptation strategies, and explores challenges for local community adaptation to climate change. More generally, the study highlights the dilemmas of climate change adaptation strategies in achieving sustainable community adaptation to climate change. Three insights emerge: (1) there is unclear policy and institutional framework for the implementation of climate change resulting in ad hoc designing and implementation of community adaptation strategies; (2) although current climate change adaptation strategies help to build community resilience for a short time, failure to correspond the design of climate change adaptation strategies to social, economic, and institutional capacity building results in unsustainable adaptation initiatives and ushers in a community that perpetually depends on external assistance; (3) externally designed climate change adaptation strategies should not be expected to improve livelihood situations among communities of developing countries without improving their social and economic conditions.

Themes in Adaptation to Climate Change in Developing Countries

Climate change adaptation debate in developing countries can be summarized into four major themes. First, though developing countries contribute less to global climate change, they will bear the most impacts due to fewer social, technological, and financial resources (UNFCCC 2007; UNDP 2007; IIED 2011). Second, though external aid is important in climate change adaptation, placement of climate change issues affecting developing countries at a periphery of international climate change forums affects nature and intensity of climate change response (UNDP 2009; Rohr 2007). This is worsened by contested agrarian trajectory for achieving sustainable economic development in developing countries. In particular, the polarized debate on small-scale versus large-scale investment, subsistence versus commercial farming, and diversity versus intensity remain unsettled (Matondi et al. 2011). For instance, the extent to which western-based agricultural innovations can equitably benefit local community members is challenged by historical empirical evidences of bias of such innovations against the poor community groups such as women (Booth et al. 2006; Mkandawire 2009). Another important theme in climate change adaptation relates to the role of local institutions in climate change adaptation. There is a growing literature that argues that local institutions affect climate change impact by, *inter alia*, influencing how households are affected by climate

change impacts, shaping household response to climate change, and mediating the flow of external intervention to climate change adaptation (ICIMOD 2012; Agrawal 2008). However, several academicians have criticized local institutions as being responsible for perpetuating bias and discrimination against weak and poor groups of people in the community. In line with this view, there is also increasing call for a gendered approach to climate change adaptation in order to have a sustainable impact (Rohr 2007).

Conceptual Framework

It is not debatable that the question of climate change adaptation is more serious in developing countries. A number of scholars describe developing countries, especially those in Africa, as likely to bear the most impact of climate change leading to a number of social, economic, and environmental problems (Burton et al. 1998; Kelly and Adger 1999; Smit and Wandel 2006). This view is founded on the countries' low capability to positively adjust to the changing environmental conditions. Thus, this study adopts the concept of adaptive capacity, which is defined as the potential, capacity, or ability of a system to adapt to climate change stimuli or their effects or impacts. In general, there are six major variables that determine the ability of individuals, countries, and regions to adapt to climate change, namely:

- *Economic resources* – economic assets, capital resources, financial wealth, and poverty situation
- *Technology* – the type, level, and extent of use of technology in the community
- *Information and skills* – knowledge about adaptation options, capacity to access them, and capacity to implement the suitable ones
- *Infrastructure* – the recognition and contribution of social infrastructure to adaptive capacity
- *Institutions* – the institutional environment in which adaptation takes place, including institutions of holding society together, giving it sense and purpose and enabling it to adapt
- *Equity* – the allocation and distribution of resources within society

These variables influence the adaptive capacity of a local community to positively respond to climate change by presenting or altering an enabling environment in which adaptation takes place.

Methodology

This chapter is based on data collected through four main methods, namely, household surveys, key informant interviews, focus group discussions, and extensive literature review of community adaptation to climate change in Malawi and

developing countries. Key informant interviews were conducted with government officers in the Ministry of Agriculture and Food Security, academicians, nongovernmental organization (NGO) staff working in the area of community livelihoods, and local leaders such as chiefs and members of the local development committees. Household surveys were carried in three districts of Mzimba, Salima, and, while key informant interviews were conducted in seven districts, namely, Ntcheu, Nkhata Bay, Nkhotakota, Mzimba, Karonga, and Blantyre. Thus, the study covered all the three administrative regions of the country. Secondary data involved review of government policy documents, NGO reports, international donor reports, and academic literature on climate change. The study administered a total of 120 questionnaires in three districts, namely, Mzimba, Salima, and, which were sampled based on their vulnerability to climate risks. In these districts, the study randomly sampled three extension planning areas (EPAs), one EPA from each district, namely, Luwerezi, Chipoka, and Ngabu. Simple random sampling was then used to select 40 respondents in each EPA. In addition to household survey, literature review of existing secondary data in the study area was used to complement missing socioeconomic data.

A total of 35 key informant interviews and 16 focus group discussions were conducted. Use of both quantitative and qualitative study approaches allowed triangulation of issues coming out from each approach.

Socioeconomic Characteristics of Respondents in the Study Areas

The general socioeconomic characteristics of respondents in the districts of Mzimba, Salima, and are not different from the national trends in the rural areas of Malawi. Household surveys conducted in the areas reveal that over 90 % of households predominantly depend on rain-fed subsistence farming for their livelihood. The main food crops grown in these areas include maize, cassava, groundnuts, beans, sweet potatoes, and rice. In addition to farming, about 65 % of the household in all the districts raise livestock especially cattle, goats, chicken, and pigs. Thus, local communities' livelihood platforms are highly susceptible to climate change risks due to increased incidences of drought, floods, pests, and diseases. This situation is aggravated by declining household land size across the nation. In the study areas, the average household land holding size is less than 0.5 ha. Declining household land size, driven by high population growth of between 3.2 % (Salima) and 2 % (Chikhwawa), increases poverty levels because of the strong link between poverty and landholding size in the rural areas of the country (World Bank and GoM 2006). According to NSO (2010), incidence of rural poverty in Malawi is as high as 43 %. In the sampled areas, between 79 % and 82 % of the households live below \$1.25 a day. The implication of this situation is that high poverty levels make it difficult for most rural communities to access modern farming techniques available on the market. This situation is worsened by relatively low literacy levels in the rural areas of Malawi, including Mzimba (75.3 %), Salima (56.9 %), Chikhwawa (53.1 %), and high HIV and AIDS

prevalence rate of 9 % (NSO 2008, 2010). Generally, high levels of illiteracy and HIV and AIDS prevalence reduce the adaptive capacity of the local communities.

Climate Change Trends, Effects, and Adaptation Question in Malawi

Malawi is ranked as one of the twelve least developed countries most vulnerable to the adverse effects of climate change (World Bank 2010). This is so as the country's economy is heavily reliant on agricultural exports and subsistence farming, which are highly vulnerable to climate change. The country has a tropical continental climate characterized by wet/rainy and warm/dry seasons. The rainy season used to start in November and end in April, while dry season used to start in May and end in October. However, these seasons have not only become unpredictable but also display increased frequency and intensity of droughts and floods. Though it is difficult to predict long-term climate change scenarios, climate change pattern in Malawi mirrors climate change scenarios for Africa (Labaris 2012). Climate-related hazards such as prolonged dry spells, droughts, floods, and erratic rains have become more frequent, intense, and unpredictable. According to Oxfam (2009), Malawi's mean annual temperature has increased by 0.9 °C between 1960 and 2006, an average rate of 0.21 °C per decade. This figure is slightly higher than the global temperature increase of 0.18 °C per decade (AMCEN 2011). The average number of hot days per year has also increased by 30.5 between 1960 and 2003. The Global Climate Models project that mean annual temperature for Malawi is expected to increase by 1.0 °C to 3.0 °C by 2060 (World Bank 2011).

In the past 50 years, the country has experienced two major droughts in 1948/1949 and 1991/1992 and a number of floods related to cyclonic weather patterns in 1946, 1956, 1989, 1991, 1997, 2001, 2003, and early 2008. Prolonged periods of drought and floods were also registered between 2001 and 2005 (Action Aid 2012; UNDP 2007). According to Action Aid (2012), Malawi experienced 40 weather-related disasters between 1970 and 2006, but 16 of these occurred after 1990. In the south of the country, floods cause annual losses of about 12% of maize production, while drought destroys on average 4.6% of national maize production each year (World Bank 2011). Dry spells and heavy rains also resulted in an estimated 1.3 % economic growth slowed in 2010 (ADB 2011). Equally important, an increase in temperature has the potential to increase prevalence of malaria as its transmission and distribution is mainly determined by climatic conditions of temperature, humidity, and rainfall. In Malawi, malaria is an endemic public health problem and a leading cause of morbidity and mortality in children under age five and among pregnant women. It is estimated that Malawi experiences about six million episodes of malaria annually (GoM 2012a). All this shows that climate change and variability is real in Malawi. Despite these climate change and variability trends and effects, Malawi's contribution to global emission of green gases that are regarded as main drivers of climate change was estimated at only 29 M tons in 1990 (Mkwambisi and Gomani 2008).

Strategies of Climate Change Adaptation Employed in Malawi

Community adaptation to climate change is not a new phenomenon in Malawi. For several years local communities have protected and responded to periods of extreme climatic conditions by, inter alia, practicing crop diversification, informal irrigation, use of organic manure, mixed crop and animal farming, gathering edible fruits and tubers, and practicing seasonal migration from flood plains to upland areas (Kambewa 2005; Magombo et al. 2011). It should, however, be pointed out that autonomous adaptation to climate change and variability has become extremely costly and less rewarding to local communities over the years. Thus, planned adaptation, defined as anticipatory and government-undertaken or government-influenced adaptations, has become the option.

Malawi's climate change adaptation focus is primarily aimed at building the rural community's capacity to cope with changing climate change and making them resilient to extreme weather conditions. This focus is out of the realization that the country's economy is predominantly agro-based and 85% of its population depends on rain-fed farming for their livelihood. The agricultural sector contributes over 90 % to the country's export earnings, about 39 % of the country's gross domestic product (GDP), and accounts for 85 % of total employment (Chinsinga 2008; World Bank 2011). Over 84 % of Malawians eke their livelihoods directly out of rain-fed subsistence agriculture where women are responsible for a larger proportion of subsistence farming activities (Action Aid 2012). The effect of climate change in Malawi is aggravated by the country's heavy dependency on rain-fed farming and natural resources. It is estimated that 80 % of Malawi's food production and 65 % of the agricultural contribution to the country's GDP come from the smallholder farmers who predominantly depend on rain-fed farming (Chinsinga et al. 2012). Against this background, Malawi's National Adaptation Programmes of Action (NAPA) identified thirty-one adaptation options, and out of these options, fifteen were categorized as urgent. The following is a list of NAPA's fifteen urgent climate change adaptation options, which were further classified into high, medium, and low adaptation ranks as indicated:

- Sustaining life and livelihoods for the most vulnerable communities (high)
- Enhancing food security and developing community-based storage systems for seed and food (medium)
- Increasing crop production through the use of appropriate technologies (medium)
- Increasing resilience of food production systems to erratic rains by promoting production of maize and vegetables in dambos (river banks that have water throughout the year to support cultivation of arable crops), wetlands, and along rivers (high)
- Targeting afforestation and reforestation programs to control siltation and provision of fuel wood for their benefits, such as sources of alternative cash income (high)

- Improving energy access and security in rural areas (e.g., through extension of rural electrification program, improved stoves, and development of ethanol-based stoves) (medium)
- Improving rural nutrition (e.g., through the promotion of fish farming, rearing of small stock, and nutritional supplements for children and the sick) (medium)
- Disseminating bed nets to high malaria incidence areas (medium)
- Developing food and water reserves for disaster preparedness and response (medium)
- Developing community-based wildlife ranching and a breeding program for Nyala (medium)
- Developing and implementing strategies for drought preparedness, flood zoning, and mitigation (medium)
- Developing technologies to mitigate climate change (medium)
- Providing standby power generation (low)
- Managing forest fires in collaboration with the community (low)
- Developing small dams and other storage facilities to mitigate flooding, to harvest water, and to initiate community fish farming and breeding (high)

Within these priorities, major community adaptation strategies to climate change practiced in Malawi include practicing conservation agriculture, growing drought-resistant and high-productivity varieties of seeds, practicing agroforestry and planting tree crops, and increased irrigation farming (GoM 2006; Chinsinga 2012). Conservation agriculture is a way of managing agroecosystems to achieve higher, sustained productivity, increased profits, and food security while enhancing the environment (Mkwambisi 2012). Specific strategies within this strategy include soil conservation agricultural practices such as terracing, crop rotation, intercropping, afforestation and reforestation, micro-irrigation, and natural resources management. The basic aim of conservation agriculture is to conserve soil condition that supports plant life by reducing soil erosion and runoff.

Growing of drought-tolerant and high-productivity crops involves use of improved seeds that mature early and are resistant to increased pests and diseases that are likely to accompany climate change (GoM 2006). Most smallholder farmers in Malawi have adopted these improved varieties through Fertilizer Input Subsidy Programme (FISP) in which poor farmers access inorganic fertilizer and seeds at a subsidized price. Agroforestry and planting tree crops involve planting of soil fertility-enhancing subsistence crops and cash crops such as *Jatropha*. Besides providing food and income, it is seen as a way of enhancing the livelihoods of farmers and mitigating the effects of climate change through carbon sequestration. However, there is reluctance of smallholder farmers to adopt agroforestry in Malawi because farmers do not see immediate benefits as trees take long to mature (Chinsinga et al. 2012). Decline per capital land size is another challenge facing agroforestry.

Prospects and Challenges of Community Adaptation to Climate Change in Malawi

Unclear Policy and Institutional Framework for Climate Change Adaptation

The Malawi government is a party to the United Nations Framework Convention on Climate Change having ratified it on 21 April 1994 as an operational tool for Agenda 21. However, apart from the 2006 NAPA document, the country does not have a coherent national policy framework on climate change. The National Climate Change Policy is still being drafted. The NAPA has identified thirty-three priority interventions across eight different sectors, and fifteen of these priorities aim at reducing the vulnerability of rural communities to climate change (GoM 2006). Climate change issues are also contained in a number of government policy documents such as Malawi Growth and Development Strategy II (2011–2016), National Environmental Policy (1996), National Environmental Action Plan (1996), National Land Policy (2002), Energy Policy (2003), Forestry Policy (1996), Fisheries Policy (2001), Water Policy (2005), National Irrigation Policy and Development Strategy (1998), and the National Biodiversity and Action Plan (2005).

However, these sectoral policy frameworks exist in isolation and are at times contradictory. For instance, while conservation agriculture is highly esteemed in climate change adaptation, its implementation has been placed at the periphery because it is not prioritized by the Ministry of Agriculture and Food Security. Driven by the primacy of food security in national politics, the government has increased nominal funding toward Fertilizer Input Subsidy Programme (FISP) since 2005/2006 growing season. Thus, climate change adaptation initiatives are caught in a political dilemma as legitimacy of the Malawian government is intimately connected to food security forcing the government to target achieving food security at all costs and placing other development priorities at the periphery (Chinsinga et al. 2012). For instance, in the 2013/2014 national budget, the government has allocated almost 50% of the Ministry of Agriculture's budget to FISP (US\$187.2 million) and just over US\$9.3 million to the Ministry of Environment and Climate Change (GoM 2013). This chapter, therefore, argues that sustainable community adaptation to climate is caught up in unclear policy environment. Currently, sustainable community adaptation to climate change is not a short-term objective of the government as it greatly wants to meet the immediate food security needs of the populace. Generally, climate change adaptation policies in developing countries are engineered toward meeting the immediate needs of a large proportion of poor people. In this process, it is not the government sustainable strategy that matters but the one that brings quick political rewards. Notwithstanding its positive contribution, the contribution of government-supported FISP through the subsidization of hybrid seeds and fertilizer to food security remains very debatable. For instance, when the subsidized farm input program collapsed in 1994, the

share of land allocated to maize cultivation fell by 12 % (Action Aid 2006). This is so as most smallholder farmers cannot successfully grow hybrid maize as it is capital intensive.

Equally important, there is unclear institutional structure for managing climate change adaptation in Malawi. Currently, climate change issues are being handled by the Ministry of Environment and Climate Change, which was created in 2012. However, climate change adaptation issues are also implemented through a number of ministries and departments such as the Ministries of Agriculture and Food Security, Economic Planning, and Irrigation and Water Development. These ministries are, however, loosely coordinated resulting into duplication and at times conflicting policy objectives. This problem is aggravated by the ministries and departments' competition over the control of potential funding for climate change activities (Chinsinga et al. 2012). The lack of institutional coordination has resulted in local communities receiving contradictory messages from ministries and departments. For instance, while the Ministry of Agriculture and Food Security emphasizes the use of improved varieties of seeds in micro-irrigation projects, the Ministry of Environment and Climate Change prioritizes use of organic manure. Generally, the use of improved varieties of seeds is preferred with the objective of increasing national crop production and not really expanding local communities' livelihood platforms. The contentious issue concerning community adaptation to climate change, therefore, originates from policy stipulations of food security. In the present context, the government is significantly promoting maize production at the expense of other crops that favor specific agroecological regions. This direction mirrors the quantitative than the qualitative emphasis on community adaptation to climate change.

Local community adaptation to climate change in Malawi and many other developing countries in Africa has also to grasp with the recent government policy moves toward promotion of large-scale agriculture. Generally, policy moves toward large-scale farming are premised on two arguments, namely, the availability of large parcels of unutilized land and the contribution of large-scale agriculture to the welfare of local communities (Fisher et al. 2002). However, both justifications have been questioned by empirical experiences of large-scale investments in Malawi and other developing countries (Chinsinga et al. 2013). In the present context, large-scale agriculture is grabbing priceless land resource from local communities and makes them more vulnerable to economic shocks.

Inadequate Financial and Human Resources

One of the major challenges of local community adaptation to climate change in Malawi is limited financial and human capacity to implement adaptation programs. Generally, financial resources enhance adaptive capacity by enabling local communities to invest in environmental management and have freedom to choose appropriate climate change options. Human resource on the other hand affects the quality of implementation of adaptation strategies. Currently, Malawi will require

US\$ 22.93 million to implement five identified priority areas concerned with community adaptation to climate change (GoM 2006). Most of this financial resource is assumed to come from the donor community, which hinges on the goodwill of the donor community. Thus, global climate change adaptation initiatives present development opportunities for local communities to access government and international funding toward climate change-related investment such as adoption of fast-maturing and drought-resistant varieties.

However, international financial support toward climate change adaptation has been far below expectations. The problem is that extreme poverty among most smallholder farmers in Malawi means that they can hardly meet the costs of improved seeds, fertilizer, and chemicals. Malawi is one of least developed countries with over 39 % of the country's population estimated living below the poverty line. Among rural households, the incidence of poverty is as high as 43 % (ADB 2012). The poverty situation in the country is also exacerbated by high population growth rates of about 2.8 %, which compounds the problem of pressure on agricultural land and forests. Discussions with local communities revealed that most farmers prefer local varieties because improved varieties of seeds are costly in terms of their price and inorganic fertilizers that they require. One bag of 50 kg inorganic fertilizer costs almost US\$50, which translates to more than half of the rural population unable to buy a bag of fertilizer. According to one agricultural extension officer, "the main problem with use of improved varieties is that they require application of inorganic fertilizers and strict observations of modern farming methods." This requirement means a lot of people cannot manage to buy inorganic fertilizer (World Bank 2013). Ironically, current rainfall patterns make the growing of local varieties difficult. Equally important, while the Ministry of Agriculture prioritizes the scientific approach to adaptation, it does not have the needed human resource capacity in terms of agriculture extension workers to ensure that farmers are trained in the use of the scientific farming methods. Likewise, effective implementation of conservation agriculture demands the availability of adequate and well-trained labor force, something that is missing among rural farmers because of two conditions. Firstly, high HIV and AIDS prevalence of about 10.6 % (GoM 2012b) means that adults, especially women, spend a lot of time caring for the sick than concentrating on farming. For instance, three households reported during field interviews that they have not cultivated because they were caring for the sick during planting period. Secondly, low education levels among local communities make it very difficult for them to comprehend and adopt modern agricultural technology and practices. According to NSO (2010), 20.7 % and 13.0 % of rural women and men in Malawi, respectively, do not have any education.

Limited Information, Knowledge, and Technology on Climate Change

Community adaptation to climate change demands that communities should have and use adequate and correct information to estimate potential effects of climate

change, map vulnerable communities, and design strategies to respond to climate change effects. Thus, predictions and availability of future climate change scenarios are an important step to community adaptation to climate change. One of the greatest constraints for local communities to adapt to climate change in Malawi is limited information on expected climatic patterns due to weak technical capacity to predict weather and climatic patterns. The result is that communities are not provided with adequate climate change and variation scenarios to base their adaptation decisions on. Farmers specifically are uncertain of when to plant. The failure of the country's Department of Meteorology to provide comprehensive and long-term data on climate change and changing weather patterns does not only constrain policy making regarding climate change but is also a major source of anxiety among farmers as it increases their losses and vulnerability to climate change. According to one government official report:

We (government) do not have adequate capacity in terms of structures like data storage capacity and computers, and we lack required expertise in some areas. We also have a general shortage of staff. Lack of a Meteorological Act also affects our work because now we use the Civil Aviation Act. The draft of the Meteorological Act had to be withdrawn from Cabinet because it did not include climate change issues. (AFIDEP, 2012:27)

Lack of required technology by the Department of Meteorology means that there is inadequate up-to-date data to guide community adaptation to climate change in Malawi. This challenge is worsened by the fact that climate change research is mainly done on a global level and there is little contextualization of global data at national and subnational levels. In most developing countries such as Malawi, reversing this trend will not be achieved in the near future due to inadequate government funding channeled to capacity development of institutions dealing with issues of climate change. In general, there is overdependence on donors for funding of climate change work (Chinsinga 2012; UN OHRLLS 2009). Given the increasing social and economic needs of the population in developing countries, it is doubtful that the state will allocate adequate resources to long-term climate adaptation needs such as recruiting adequate staff dealing with climate change and buying modern equipments for climate prediction. For instance, the Department of Meteorology is operating with less than half required human capacity. Thus, donor support will for a time remain the country's sure hope of accessing modern technology in climate change human capacity development. This hope is, however, grossly threatened by the general failure of developed countries to honor their climate change adaptation promises to developing countries. According to the IIED (2011), developed countries have made little progress toward their overall fast-start adaptation target currently pegged at 19–25 % of total fast-start finance.

Currently, there is a lot of confusion about the best strategy to climate change adaptation among the local communities and even among the educated group. For instance, over half of interviewed academicians outside the agriculture specialization argued that most modern farming techniques such as use of chemicals are not good as they reduce soil fertility. According to one academician who usually designs farmers' radio programs, chemicals require following strict procedures as

they may make the soil completely unproductive. Another academician interviewed reported that his relatives refused to use improved varieties and chemicals in their farm because they do not trust modern seeds and chemical. They argued that “these seeds will make us poor because we cannot use them again next year, what are we going to do if we fail to find money to buy new seeds.” These sentiments were also common among local farmers, which show that there is a lot of mistrust toward new farming technologies. Thus, the battle for local community adaptation to climate change will be easy unless farmers have adequate information on the subject.

Social Infrastructure and Equity

Successful community adaptation to climate change requires that local resources be equitably allocated and distributed among local community members. Equitable allocation of resources within the community largely depends on the extent to which individuals are able to participate in adaptation activities without social, economic, or political barriers. This is one of the challenges facing local communities in the effort to adapt to climate change in Malawi. Generally, there are three main climate change adaptation strategies being practiced in Malawi, namely, conservation agriculture, use of drought-resistant seed varieties, and agroforestry. The Least Developed Countries Fund (LDCF), for instance, funded Malawi US\$3 million to implement rural livelihood and agriculture which largely included use of improved crop seeds, improved crop sequencing, and irrigation. However, such strategies have the potential of increasing income inequality among local communities by favoring the haves in society. The benefits of improved crop sequencing are premised on growing of two crops in one growing season through following strict growing calendars. Lessons from many irrigation initiatives in the country such as Mpemba irrigation scheme in Ntcheu, however, reveal that crop sequencing may not be a panacea for climate change adaptation to the powerless and landless groups of people in a community. This is so as land parcels belonging to individual households are compulsorily subdivided to willing households during dry season, thereby creating two land right arrangements, namely, individual land user rights during rainy season and collective land user rights during dry season. The expectation is that two strict crop-growing seasons are going to be followed and that crops for each growing season are going to mature strictly within the specified growing season.

However, this assumption may not be the case with increasing unpredictable rainfall pattern in the area (see UNDP 2007). Again, the designed strict growing arrangement restricts the types of crops grown during rain-fed and dry season as crops have different maturing periods. Some crops such as maize mature within 4 months, while some crops mature late but are also consumed for a long time while in the field. According to the interviews conducted with the communities in the area, only maize and vegetables are allowed to be grown under this arrangement and crops which are grown late into rainy season and mature late such as sweet potatoes are not allowed. The problem is that some of the crops not allowed to be

grown under this arrangement form a major part of the local community food nutrient. This situation calls into question the extent to which local people will benefit from the climate change adaptation strategies. As earlier explained, crops grown in the irrigation scheme are preferred with the objective of increasing national crop production and not really expanding local livelihood platforms. The contentious issue concerning community adaptation to climate change, therefore, originates from the capitalistic conceptualization of food security. In the context of Malawi, increased production has emphasized the quantitative aspect and disregarded the qualitative aspects of diversified livelihood. Analysis of climate change adaptation debate supports this trend by emphasizing increased production of crops widely involved in market economy at the expense of local crops which form a major part of local livelihoods.

Conclusion

Community adaptation to climate change in developing countries is vital, taking into account the negative effects of climatic change. There is widespread agreement that external assistance is necessary if this process is to be achieved. To this end, there is generally real and expected global assistance toward climate change adaptation. However, analysis of local community adaptation to climate in Malawi has revealed that communities face a number of challenges to adapt. Firstly, there is no clear policy and institutional framework guiding climate change adaptation initiatives. Secondly, local communities lack the necessary monetary resources to effectively engage in adaptation initiatives. In particular, high poverty and illiteracy levels make it difficult for the communities to adopt new farming technologies. These observations suggest one critical point to consider; although climate change adaptation is a sure way of escaping negative effects of climate change, its success heavily depends on a number of development-related variables. Thus, arising from this observation, climate change is unlikely to be successful if it is implemented in isolation of other economic development variables especially poverty, literacy, and governance.

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