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Gender vulnerability to climate variability and household food insecurity

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Climate variability presents different challenges for men and for women in their efforts to ensure household food security. However, despite their central role, gender issues have received only cursory attention in adaptation studies. This article looks at causes of gender vulnerability to climate variability and household food insecurity in one sub-Saharan African country: Malawi. Data were collected through a household questionnaire survey, focus group discussions and key informants' interviews in Chikhwawa and Ntcheu districts, located in the southern and central areas of Malawi. Results revealed that exposure and sensitivity to climate risks vary between men and women; therefore, each gender responds differently to climate risks, with men having more opportunities than women. The results highlight the need for policies and interventions to empower women in the access to resources that can strengthen households' resilience to climate variability.

Keywords: adaptation; Africa; climate variability; food insecurity; gender; Malawi; vulnerability

1. Introduction

Issues of climate change and variability have received global attention over the last few years (Karim, 1996; Watson et al., 1996; Kelly and Adger, 2000; O'Brien and Leichenko, 2000; Bohle, 2001; IPCC, 2007). Africa is reported to experience the worst effects of climate change and is the most vulnerable continent (Jones and Thornton, 2003; IPCC, 2007). Flooding and droughts are now common across Africa (IPCC, 2007). Climate projections in Southern Africa suggest that variability is likely to increase in the future and extreme weather events might become more frequent (Tadross et al., 2005; Hewitson and Crane, 2006; Ziervogel et al., 2006). Malawi is reported as one of the worst-affected countries in the region (SADC, 2002; GOM, 2006) with frequent floods and droughts. Therefore, understanding vulnerability to climate variability has become one of the priority areas in research in order to

develop appropriate strategies that will enable rural communities to adapt to the current climatic risks.

One of the most ignored areas of research in climate studies is gender vulnerability. Yet, climate variability poses different challenges for rural men, women, youth and the elderly. It is widely known that the effects of climate change and variability will affect the poorest people of the poorest countries more than rich people (Handmer et al., 1999; Olmos, 2001; Boko et al., 2007). In other words, the poorest and most marginalized people are most vulnerable to climate change and variability impacts (IPCC, 2007). Women consist of the largest proportion of the poorest people in developing countries and are highly dependent on local natural resources (Nelson et al., 2002; CSW, 2008). They are more likely to be vulnerable to climate variability impacts than men because of social and cultural conditions that influence access to resources and division of labour.

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Vulnerability is dynamic, locally specific and manifested along social, gender and poverty lines (Nelson et al., 2002; Ziervogel et al., 2006; Acosta-Michlik et al., 2008; Hertel and Rosch, 2010). The effects of climate variability and extreme weather events may, therefore, increase the existing inequalities and vulnerabilities between men and women. It is thus important to understand current vulnerabilities so that appropriate strategies can be developed to cope with future impacts (Bohle et al., 1994).

This article examines the causes of gender vulnerability to climate variability in terms of exposure, impacts and adaptive capacity and how it exacerbates household food insecurity. This aims to help inform policy or interventions that support rural communities to cope and adapt to current and future effects of climate variability.

2. Conceptual framework and objectives

It is essential to understand gender vulnerability to climate variability in order to develop appropriate adaptation strategies. Vulnerability to climate variability can be looked at in two-fold: firstly, exposure to climatic factors or risks, and secondly, inability or ability to cope with or adapt to the impacts of climate factors (DFID, 2004; Lonescu et al., 2005; Ziervogel et al., 2006; Babugura et al., 2010). Climatic risks impact on groups of people that are at different levels of preparedness and resilience and with varying capacities for recovery. Natural hazards have visible impacts on people while changes in rainfall and temperature affect people indirectly through farming. The extent of vulnerability varies with seasons, individuals, households and communities. In this study, it is assumed that hazards are experienced by all households in a community, but exposure to hazards varies among individuals depending on their roles and responsibilities and this leads to different exposure to climate risks and access to resources. As a result, households have varied adaptive capacity to respond to climate risks and hence different vulnerability to food insecurity

(Figure 1). Likewise, impacts from risks occur when a person is exposed to such risks and may vary among individuals and households. Exposure to risks depends on several factors that place people at the risk of becoming livelihood and food insecure. The highly vulnerable are those who are highly exposed and sensitive to risks and their adaptive capacity is constrained by natural, social, economic and physical factors (Watson et al., 1996; Kasperson, 2001). The way an individual may respond to risks depends on many factors such as access to resources and cultural issues. This study, therefore, provides evidence of local dynamics and underlying vulnerabilities that require attention before pursuing adaptation policies and interventions.

3. Methodology

3.1. Area of study

A survey was conducted in two extension planning areas (EPAs), Mitole in Chikhwawa district

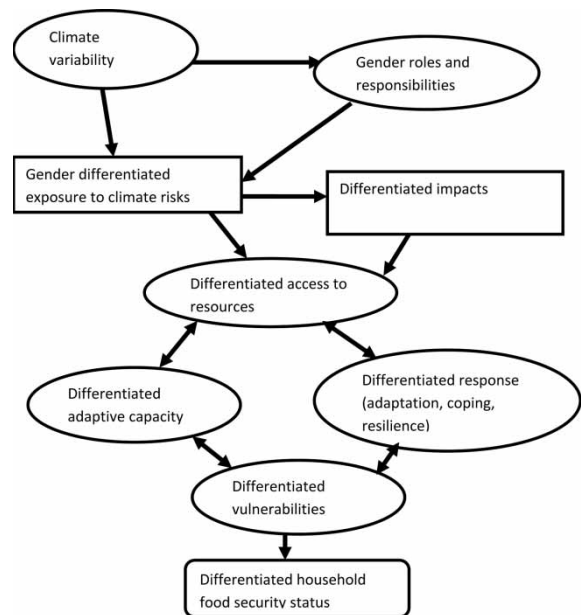


FIGURE 1 Conceptual framework: gender vulnerability to climate variability and household food insecurity

and Manjawira in Ntcheu district. Chikhwawa experienced erratic and variable rainfall, ranging from 274 to 1075 mm between 1979 and 2009. Temperatures are high with an average of above 20°C. Chikhwawa experiences floods and droughts almost annually. These extreme events have increased in intensity and frequency since 2000 (Action Aid, 2006). Mitole EPA experiences both floods and droughts. On the other hand, Ntcheu experienced seasonal total rainfall within the ranges of 280 to 1871 mm from 1979 to 2009, which varied depending on the altitude. The mean temperature ranges from 15 to 20°C due to varying topography. Ntcheu district experiences dry spells and droughts in some areas and floods in other areas. Manjawira EPA is prone to dry spells and droughts.

Agriculture is a major source of livelihood for rural communities in the two districts. The major food crops grown are maize, millet, rice, sorghum and other horticultural crops, while rice, potatoes, sweet potatoes (which are also food crops) and cotton provide an economic outlet besides other activities like trading, handicrafts and transport businesses. The staple and widely grown food crop is maize and is central to the food security of the communities. The districts have also common livestock like chicken, goats, cattle, pigs, sheep, rabbits, doves and ducks, which are key sources of protein, along with fish. The two districts have varied cultures with Ntcheu practising a matrilineal system and Chikhwawa a patrilineal system in terms of marriages and settlement patterns. Their culture plays an important role in the access to resources and division of labour as it dictates the roles and responsibilities expected by each gender group.

3.2. Research design, data collection and analysis

Cross-sectional comparative data were collected through household questionnaire interviews and key informants' interviews. For the purpose of this study, a household is defined as a group

of individuals living under the same roof. By this definition, a household comprises the household head, his/her spouse, children, nephews, nieces and other dependants. An exploratory study was carried out to establish the risk factors of climate variability among men and women. A total of 200 households were randomly selected and among these were 96 (48 per cent) female-headed households (Fhh) and 104 (52 per cent) male-headed households (Mhh). Cross-sectional comparative data were collected from the study areas in a period of three months, from January to March 2010.

Focus group discussions were conducted with groups of men and women separately in 15 villages. A total of 30 focus group discussions were conducted. Participatory data collection techniques in gender analysis, such as activity profile, livelihood profile, impact assessment, free listing, preference ranking, seasonal calendars and time lines, were used to solicit information on climate risks, impacts, gender roles and responsibilities, sources of livelihoods and access to and availability of resources. From these data, capabilities, challenges and opportunities to implement adaptation strategies were identified among gender groups.

Qualitative data were analysed as themes using content analysis. Data were coded and logically organized into a matrix of related issues such as climate risks, exposure, impacts, sensitivity and vulnerability using grounded theory (see also Glaser and Strauss, 1967; Goulding, 1999; Mkwambisi et al., 2011). Direct quotes were also used to explain, support and clarify important issues observed by the communities. Survey data were analysed using Statistical Package for Social Sciences (SPSS) to obtain descriptive statistics.

4. Results and discussion

The results are summarized in terms of (1) gender roles, responsibilities and livelihoods; (2) access to resources; (3) exposure to climate risks, impacts, sensitivity and gender vulnerabilities; and (4) coping and adaptation strategies.

4.1. Gender roles and sources of livelihoods

Focus group discussions revealed that women and men have different roles and responsibilities in their homesteads (Table 1). The responsibilities among gender groups were different between cultures while the roles were common across cultures. For example, the provision of household needs is the responsibility of men in a matrilineal culture in Manjawira, while it is the responsibility of both men and women in male-headed households in Mitole. It was, however, noted that these trends have changed with climate variability; the responsibilities which were previously for men are now shared between men and women because of the increased demand at the homestead. Apart from roles and responsibilities common for men and women, women have extra roles and responsibilities such as collecting water and firewood, fetching and preparing food, household chores, taking care of children and the sick and child bearing.

It was observed that most of the women's roles are routine activities and the demand at the homestead is daily, unlike men's roles which are mostly demanded when need arises. The timeline revealed that women are engaged in one role or the other throughout the day while men have some free time in which they engage in income-generating activities. Culturally, most of these routine activities are carried out by women and girls and they suffer greatly when the resources are scarce. Even though some men's roles may have similar effects, their roles are not regular and pertinent to the daily demands of the household. Reduction of natural resources results in more demand for labour and time from women, hence, reducing the quality and quantity of time and labour which is required for farm activities, income-generating activities, food preparation and other resources such as education. Consequently, food availability, access and nutrition are compromised.

The results also showed that most of the women's roles are dependent on natural resources such as water and fuel wood. These findings are consistent with those of similar studies

conducted in other developing countries, for example, Nelson et al. (2002), Babugura et al. (2010) and Ribeiro and Chau'que (2010). In female-headed households, all the roles and responsibilities are taken by women and sometimes assisted by their elder children. This renders female-headed households more vulnerable when resources are scarce. However, complementary roles empower a household which is headed by a male to have more opportunities than a female-headed household.

The main livelihoods in the study areas are agriculture, on-farm informal employment, small-scale businesses including selling charcoal and firewood. About 78 per cent male-headed and 77 per cent female-headed households indicated agriculture as the main source of livelihood. The sources of livelihood are presented in Table 2.

As can be seen from the table, more men than women were engaged in selling charcoal and firewood, with Manjawira having more households engaged in charcoal business than Mitole; perhaps because the area is not yet deforested. It was noted that more women than men engage in subsistence agriculture as a source of food, growing mainly food crops; while men grow cash crops, such as cotton in Mitole. The discussions with farmers revealed that in the past, around the 1970s and the 1980s, households were relying on agriculture because there was surplus from different types of crops and enough food and income from farm products. But harvests decreased from the 1990s onwards; the harvest is not enough even for household food consumption. As a result, the demand for other livelihoods has increased. One farmer from Manjawira lamented that:

We used to grow many crops and harvest enough food to feed our families and sell surplus to meet other household needs. However, farming is no longer reliable; therefore, we cut down trees for charcoal which brings income.

This statement was echoed by many women and men in different focus group discussions from both areas. The farmers noted that the shift in

TABLE 1 Roles and responsibilities

Roles and responsibilities	Study area	Gender	Frequency of demand	Comment
Providing needs of household	Mitole	Women and men	Daily	In a household where there is both a man and a woman, they help each other to source for household requirements while in female-headed household it is a woman who is responsible. In some cases older children especially boys also help
	Manjawira	Men		In Manjawira, a man is responsible for providing the needs of household. Female-headed households are exceptional
Caring for the sick	Mitole	Women	As need arises	Hospitals are far from the villages
	Manjawira	Men and women		Respondents reported increased cases of diseases like malaria and cholera (due to unsafe water especially during floods). This increases the burden on women as they spend time taking care of the sick
Fetching water	Mitole	Women and girls	Daily	Other villages have boreholes while others walk long distances to fetch water. During dry season most wells and rivers dry up and they queue for water in boreholes and this increases time spent on collecting water
	Manjawira	Women and girls		
Fetching firewood	Mitole	Women	Daily	In most cases men fetch firewood in order to sell as an income while women fetch firewood for cooking at the household
	Manjawira	Women and men		
Caring for children and household	Mitole	Women and girls	Daily	Prepare food, provide water for bathing and washing clothes, sweeping, mopping and cleaning household utensils. Most of these activities require either water or firewood
	Manjawira	Women and girls		
Farm activities	Mitole and Manjawira	Women, men and children	Seasonal	Both men and women are involved in when both are present in a household
Building, digging pit latrines and graves, fetching poles for house roofs and fences	Mitole and Manjawira	Men and boys	As need arises	Walk long distances to look for poles but the demand is not on daily basis

Source: Focus group discussions.

livelihoods is attributed to climate variability which has rendered agriculture unreliable. As an adaptation, communities have diversified their livelihoods and depend more on either selling

charcoal or informal employment than before. However, charcoal processing is a challenge to most of them, especially among women when there is a food shortage. Hence, most women

TABLE 2 Sources of livelihood

Activity	Fhh (Manjawira)	Mhh (Manjawira)	Fhh (Mitole)	Mhh (Mitole)
Agriculture	✓	✓	✓	✓
On-farm employment (<i>Ganyu</i>)	✓	✓	✓	✓
On-farm employment from sugarcane estates			✓	✓
Selling charcoal		✓	✓	✓
Selling firewood		✓		✓
Petty businesses	✓	✓	✓	✓
Beer brewing	✓		✓	
Bicycle hiring				✓
Construction		✓		✓
Handcraft	✓		✓	

Source: Livelihood profile from focus group discussions.

were engaged in selling charcoal while processing was done by men. The high demand for charcoal in urban areas has rendered charcoal selling a profitable business. Consequently, more trees are being cut down and thus increasing deforestation. It was stated by the respondents that charcoal business was not an appropriate way of adapting. The activity is being undertaken because the communities have few alternative ways to adapt. It was also observed that most men engage in on-farm employment while women work in the gardens. Perhaps this is due to prescribed roles and responsibilities of men and women as income earners and food producers, respectively.

4.2. Access to resources

Adaptation to climate variability demands that households have resources (natural, physical,

human and financial). But the discussions and interviews revealed that access to and control over these resources are different for men and women, with men having more access. Table 3 presents a summary of the resources attained by male-headed and female-headed households. For example, male heads of households had attended at least primary education (mean 1.12 for Manjawira, 1.04 for Mitole) while most female heads of households had no formal education (median 0.88 for Manjawira and 0.63 for Mitole). The availability of food through production is influenced by the availability of land, inputs and human labour. All these factors are gendered. For example, the quality of labour for women is constrained by household chores whose demand increases as the resources become scarce due to climate variability. Access to nutritious foods depends on the availability of income or social networks. However, income is influenced by access to diversified livelihoods which is also a constraint for women. Moreover, women are responsible for household food preparation and nutrition. Poor access to resources and livelihood implies poor quality of food for the household. Therefore, adaptation can be gender biased if gender vulnerabilities are not taken into consideration and this can lead to different food security status.

4.3. Climate variability impacts

There are direct and indirect impacts of droughts, increased temperatures, late rains, floods and low amount of rainfall on communities in the study areas. The direct impacts are mainly caused by disasters that cause physical harm or stress while indirect impacts are manifested through their roles and livelihoods. The group discussions revealed that increased temperature has resulted in heat stress, increased cases of health problems such as Malaria and increased demand for water at the homestead. This affects the quality of human labour in farming and income-generating activities. In addition, reduced amount of rainfall, floods, droughts, late rains and short rain

TABLE 3 Access to resources

Resources	Unit, definition	Manjawira		Mitole	
		Mhh	Fhh	Mhh	Fhh
Education	Scaled 0–3, 0 for no education, 1 for primary, 2 for secondary, 3 for tertiary	1.12 (mode = 1)	0.88 (mode = 0)	1.04 (mode = 1)	0.63 (mode = 0)
Land size	Hectares	2.47	1.82	1.84	1.28
Maize harvests	50 kg bag	11.24	7.67	6.26	4.45
Extension services	Access, binary: 1 for yes, 2 for no	32	33	43	35
Agricultural technologies	Access, binary: 1 for yes, 2 for no	37hh for 1	28hh for 1	33hh for 1	30hh for 1
Climate information	Access, binary: 1 for yes, 2 for no	35hh for 1	31hh for 1	34hh for 1	24hh for 1
Type of fertilizer	Scaled 1–3: 1 for chemical, 2 for manure, 3 for no fertilizer	46hh for 1 (mode = 1)	48hh for 1 (mode = 1)	27hh for 1 (mode = 1)	21hh for 1 (mode = 1)
Household income	Malawian Kwacha per year	38330.00	17867.35	35191.11	25686.96
Income per adult equivalent	Malawian Kwacha per year	9469.07	5775.83	9312.81	6889.41
On-farm employment	Binary: 1 for yes, 2 for no	39hh for 1	42hh for 1	46hh for 1	31hh for 1

Source: Household questionnaire survey.

have reduced the crop yield due to crop failure and destruction, water quality and quantity, water sources because some rivers and wells have dried up, firewood supply, and increased cases of water-related diseases. Since most of the farming activities and households chores are carried by women in the area, they are the most affected by the effects of climate variability and are therefore the most vulnerable to food insecurity. Table 4 provides a summary of climate risks, exposure to risks through roles and responsibilities, impacts, sensitivity and gender vulnerability to risks.

4.4. Coping and adaptation measures: Capabilities and challenges

Similar coping and adaptation strategies were observed in Mitole and Manjawira (Table 5). The findings from the group discussions and

household interviews showed that coping strategies for shortage of food due to less rainfall, dry spells and droughts included skipping meals or reducing the number of meals per day so that food can last longer; reducing the quantity of food; substituting usual meals (*nsima*) with less preferred meals like vegetables, fruits, porridge and locally diluted drinks. In the case of reduced water and firewood resources, households cope by using water sparingly and using energy-saving technologies for cooking. Other strategies like selling livestock and other assets, food for work, finding alternative livelihoods like selling charcoal and off-farm employment also provide a temporary relief for the households. It was, however, noted that few male-headed households could skip meals because men had diverse livelihoods that complemented other sources of food and income in the homestead. Skipping or reducing the number of meals is also documented as a common coping mechanism in the SADC

TABLE 4 Climate risks, gender roles and responsibilities, impacts, sensitivity and gender vulnerability

Climate risks/ disaster	Exposure (through roles and responsibilities)	Impacts	Sensitivity	Gender vulnerability
Temperature	Farming activities	Stress because of heat therefore less work is done	Lack of farm machinery such as ploughs. Hoes are used for farming	Women are mostly engaged in farm activities while men are engaged in income-generating activities
Increased temperatures	House chores such as collecting water, firewood, digging pit latrines	Collecting water and firewood expose women to more heat stress	Inadequate boreholes	Women and girls are responsible for collecting water and firewood. Water is a daily requirement in a household
Extended hot season	Caring for sick people and children	Demand for water at the household is high	Degraded forests	Increased workload for women to care for the sick and children as care givers
		Increases cases of health problems such as Malaria	Boreholes/wells are far from the households Health facilities are far from the communities	
Rainfall	Farming activities	Reduced crop yield	Cultivating along the river banks	It is often women who plant and this increases their workload
Reduced quality and quantity of water	Household chores such as collecting water	Planting more than once resulting into Wastage of inputs	No access to climatic information	Increased cases of malnutrition among children and expectant mothers due to poor quality and quantity of food
Late rains and short rainy season	Alternative livelihoods	More time spent on collecting water because of either long distances or queuing for reduced water in boreholes	Limited access to other sources of livelihood	Stress among men when livelihoods are destroyed and they cannot provide for the household
Unpredictable and erratic rains	Men's responsibility of providing security	Wells dry up	Men are bread winners in their homestead	Women and girls walk long distances to fetch water and spend more time queuing for water
Increased intensity and frequency of droughts, dry spells and floods		Migration especially among men	Inadequate health facilities and far from communities	Breakdown of marriages as men migrate
		Emergence of new or more water catchment areas	Long distances to collect firewood sometimes crossing rivers	High risk of drowning as women and girls fetch water and firewood along river banks

Continued

TABLE 4 Continued

Climate risks/ disaster	Exposure (through roles and responsibilities)	Impacts	Sensitivity	Gender vulnerability
		Destruction of infrastructure, e.g. houses and schools	Lack of privacy	High risk of drowning as men provide security for women High risk of sexual abuse for women and girls in the camps

Source: Focus group discussions and key informants interviews.

TABLE 5 Coping and adaptation strategies

Coping Strategies	Gender of household head		Adaptation strategies	Gender of household head	
	Male	Female		Male	Female
On-farm employment (<i>ganyu</i>)	24	30	Small-scale business	40	46
Substitute meals with less preferred food	26	28	Irrigation	46	24
Reduce number of meals	34	78	Drought-resistant crops	2	4
Food for work	6	2	Donations	13	13
Skipping meals	7	42	Animal farming	1	0
Begging	2	5	Soil and water conservation	30	4
Donations from relatives/friends	2	5	Migration	5	0
Sell livestock	6	0	Selling charcoal	43	24
			Diversify crops	34	35

Source: Household questionnaire survey.

region (Norton et al., 1994; SADC, 2002; De Waal and Whiteside, 2003).

Results from the discussions and key informants' interviews showed that the adaptation strategies to address effects of dry spells, droughts and less rainfall include soil and water conservation technologies, planting trees to establish community woodlots, community grain banks in Manjawira, planting early-maturing and drought-resistant crops, planting different types of crops such as maize, cassava, groundnuts, sweet potatoes, millet, cotton and sorghum (intercropping and mixed farming), using modern agricultural technologies such as hybrid seeds and conservation agriculture, and using energy-saving stoves. Migration was also

common among communities in Mitole. However, it is mostly men who migrate to look for employment or food because, culturally, women do not provide for the needs of the household. Besides, engaging in small-scale businesses is a common adaptation strategy among women while men engage in selling charcoal and firewood. It may be interesting to note that women were more active in establishing community woodlots by participating in tree nurseries and planting trees. This was so because woodlots provided solutions to the depleted firewood, thereby reducing their workload. Additionally, it was found that women had strong and organized networks that could easily be used for interventions.

There were challenges in implementing and adopting adaptation strategies. Firstly, the workload of house chores increases when there is increased temperature, dry spells and droughts because of high demand for resources and scarce of resources such as water and firewood. Hence, women do not have enough time to engage in income-generating activities like off-farm employment and business. It is mostly men who look for off-farm employment. In some cases, the demand for on-farm employment is too much for women. For instance, in Mitole, both men and women start work before dawn at Illovo Sugar Company and go back to their homes in the evening. The discussions with men and women groups from Mitole revealed that the work is sometimes so hard for women that some engage in sexual relationships with men in order to get assistance to complete their pieces of work. This behaviour has brought mistrust in marriages and therefore most men do not allow their spouses to engage in such types of employment.

Other challenges include poverty, inadequate alternatives for livelihoods, unavailability of farm inputs, inadequate extension services, illiteracy, inadequate income and low producer prices for farm products like cotton. Some community initiative ways of adapting, such as community grain banks, are a challenge because of lack of appropriate post-harvest handling technologies. Women complained of high demand for unaffordable pesticides in grain banks. Other technologies, such as marker ridges, are labour intensive and time consuming especially for women, resulting in low adoption. In addition, some adaptation strategies introduced by non-governmental organizations and other partners have few beneficiaries. Therefore, the impact at community level is low, and this sometimes promotes conflicts and theft between the beneficiaries and non-beneficiaries.

It was also observed that the implementation of adaptation strategies was different at the household level due to differences in access to resources. Households with a higher income were more able to adopt the use of hybrid seed

and other technologies to adapt to climate variability. This finding complements the diffusion of innovation theory by Rogers (1995) that high-income households have the required knowledge and resources, and can understand the benefits of adopting new ideas (see also Mkwambisi et al., 2011).

The analysis from discussions and household interviews implies that women are more vulnerable to household food insecurity than men because they have inadequate alternative ways to adapt. This is because of increased work pressure at the homestead and overdependence on agriculture and natural resources which are highly affected by climate variability. Furthermore, women are faced with unequal distribution of resources at the household level, influenced by culture. However, women were keen to implement strategies that reduce their workload at the homestead. The willingness to implement adaptation strategies is an opportunity for introducing appropriate strategies.

5. Conclusion

Climate variability and gender inequalities are threats to achieving household food security. Gender vulnerabilities increase with the intensity of climate variability effects. Mainly, gender roles, responsibilities and livelihoods are impacted and this reduces the quality and quantity of resources for adaptation. With the current trend in climate factors, agriculture is no longer reliable and communities need to diversify their livelihoods. However, both men and women have few options for livelihood diversification. Hence, agriculture remains their prime source of livelihood. Based on these findings, agricultural policies that support adaptation strategies should take into account the diversity in climate impacts and gender vulnerabilities. Policies and interventions to assist communities to adapt should address factors that increase household vulnerability to adapt. Therefore, policies that improve agricultural production, health facilities, availability of water sources and energy-saving

cooking technologies, and promote the empowerment of women can likely improve household food security in Malawi.

In addition, interventions must target a wider population because climate variability is a community issue and affects all households. This will increase food security at the community level and also improve household food security through social networks. Furthermore, policies that restrict the minimum age for marriages and child labour can likely increase the education levels of girls in areas that are highly affected by climate variability. Although some gender roles change due to climate variability impacts, there is need for sensitization and empowerment for both men and women to build strong networks in order to effectively adapt and reduce vulnerability to food insecurity.

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References

- Acosta-Michlik, L., Kelkar, U., Sharma, U., 2008, 'A critical overview: local evidence on vulnerabilities and adaptations to global environmental change in developing countries', *Global Environmental Change* **18**, 539–542.
- ActionAid, 2006, *Climate Change and Smallholder Farmers in Malawi: Understanding Poor People's Experiences in Climate Change Adaptation*, Action Aid Report, October 2006, London [available at www.actionaid.org].
- Babugura, A., Mtshali, N., Mtshali, M., 2010, *Gender and Climate Change: South Africa Case Study*, Heinrich Böll Foundation Southern Africa, Cape Town.
- Bohle, H.G., 2001, 'Vulnerability and criticality: perspectives from social geography', *IHDP Update* **2**, 1–5.
- Bohle, H., Downing, T., Watts, M., 1994, 'Climate change and social vulnerability', *Global Environmental Change* **4**(1), 37–48.
- Boko, M., Niang, I., Nyong, A., Vogel, C., Githeko, A., Medany, M., Osman-Elasha, B., Tabo, R., Yanda, P., 2007, 'Africa climate change 2007: impacts, adaptation and vulnerability', in: M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden, C.E. Hanson (eds), *Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, Cambridge University Press, Cambridge, UK, 433–467.
- Commission on the Status of Women (CSW), 2008, 'Emerging issues, trends and new approaches to issues affecting the situation of women or equality between women and men', *Gender Perspectives on Climate Change*, Issues paper [available at www.un.org].
- Department for International Development (DFID), 2004, *Climate Change in Africa* [available at www.dfid.gov.uk].
- De Waal, A., Whiteside, A., 2003, *New Variant Famine: AIDS and Food Crisis in Southern Africa* [available at www.earthinstitute.columbia.edu].
- Glaser, B., Strauss, A., 1967, *The Discovery of Grounded Theory: Strategies for Qualitative Research*, Aldine, Chicago.
- Goulding, C., 1999, *Grounded Theory: Some Reflections on Paradigm, Procedures and Misconceptions*, Working Paper Series June 1999, WP000/99, University of Wolverhampton, Management Research Centre, UK.
- Government of Malawi (GOM), 2006, *Malawi National Adaptation Programme Plan of Action*, UNFCCC, Ministry of Mines, Natural Resources and Environment, Environmental Affairs Department, Lilongwe.
- Handmer, J., Dovers, S., Downing, T., 1999, 'Societal vulnerability to climate change and variability', *Mitigation and Adaptation Strategies for Global Change* **4**, 267–281.
- Hertel, T.W., Rosch, S.D., 2010, *Climate Change, Agriculture and Poverty*, Policy Research Working Paper 5468, The World Bank, Development Research Group, Agriculture and Rural Development Team.
- Hewitson, B.C., Crane, R.G., 2006, 'Consensus between GCM climate change projections with empirical downscaling: Precipitation downscaling over South Africa', *International Journal of Climatology* **26**, 1315–1337.
- Intergovernmental Panel on Climate Change (IPCC), 2007, *Climate Change 2007: Climate Change Impacts, Adaptation and Vulnerability*, IPCC Working Group II Report [available at www.ipcc.ch/pdf].
- Jones, P.G., Thornton, P.K., 2003, 'The potential impacts of climate change on maize production in Africa and Latin America in 2055', *Global Environmental Change* **13**, 51–59.

- Karim, Z., 1996, 'Agricultural vulnerability and poverty alleviation in Bangladesh', in: T.E. Downing (ed.), *Climate Change and World Food Security*, Springer-Verlag, Heileberg, 307–346.
- Kaspersen, R., 2001, 'Vulnerability and global environmental change', *IHDP Update* 2, 2–3.
- Kelly, P.M., Adger, W.N., 2000, 'Theory and practice in assessing vulnerability to climate change and facilitating adaptation', *Climatic Change* 47(4), 325–352.
- Lonescu, C., Klein, R.J.T., Hinkel, J., Kavi, K.S., Klein, R., 2005, *Towards a Formal Framework of Vulnerability to Climate Change*, Newater Working Paper 2 and FAVAIA Working Paper 1, Potsdam Institute for Climate Impact Research, Potsdam, Germany.
- Mkwambisi, D.D., Fraser, E.D.G., Dougill, A.J., 2011, 'Urban agriculture and poverty reduction: evaluating how food production in cities contributes to food security, employment and income in Malawi', *Journal of International Development* 23(2), 181–203.
- Nelson, V., Meadows, K., Cannon, T., Morton, J., Martin, A., 2002, 'Uncertain predictions, invisible impacts, and the need to mainstream gender in climate change adaptations', *Gender and Development* 10(2), 51–59.
- Norton, A., Owen, D., Milimo, J.T., 1994, *Zambia Poverty Assessment*, Report No. 12985 – ZA, 3, World Bank.
- O'Brien, K., Leichenko, R., 2000, 'Double exposure: assessing the impacts of climate change within the context of globalization', *Global Environmental Change* 10, 221–232.
- Olmos, S., 2001, 'Vulnerability and adaptation to climate change: concepts, issues and assessment methods', Foundation Paper, *Climate Change Knowledge Network* [available at www.cckn.net].
- Ribeiro, N., Chau'que, A., 2010, *Gender and Climate Change: Mozambique Case Study*, Heinrich Böll Foundation Southern Africa, Cape Town.
- Rogers, E.M., 1995, *Diffusion of Innovations* (4th edn). The Free Press, New York.
- Southern African Development Community (SADC), 2002, *Understanding and Responding to Fragile Livelihoods in Southern Africa*, SADC Food Security Network Ministerial Brief [available at www.savethechildren.org.uk].
- Tadross, M., Jack, C., Hewitson, B., 2005, 'On RCM-based projections of change in southern African summer climate', *Geophysical Research Letters* 32, L23713. doi: 10.1029/2005GL024460.
- Watson, R.T., Zinyoera, M.C., Moss, R.H., 1996, *Climate Change 1995: Impacts, Adaptations and Mitigation of Climate Change: Scientific-Technical Analysis, Contribution of Working Group II to the Second Assessment Report of the Intergovernmental Panel on Climate Change*, Cambridge University Press, Cambridge.
- Ziervogel, G., Bharwani, S., Downing, T., 2006, 'Adapting to climate variability: pumpkins, people and policy', *Natural Resources Forum* 30, 294–305.