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A Note on Climate Change Impact and Adaptation Strategies in North Kordofan State, Sudan

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Abstract: The study objectives were to explore the climate change impacts experienced based on the perception of rural households and to explain the adaptation strategies for rural households. Primary data were collected using structured interviews, key-informant interviews and field observations. The secondary data were collected from reports. Random sampling technique was applied to select 200 forest-dependent households in Um-Rawaba locality (100 households) and Sheikan Locality (100 households) in North Kordofan. The data were analyzed using the SPSS statistical package. Descriptive statistics was used to identify dominant responses between households. The study results revealed that the households influenced by local climate change based on their perceptions. The main adaptation strategies by the households were assets selling, saving, reliance on social relations, feeding on wild plants, wild fruits, wild animals; and temporary migration.

Keywords: Climate change; Vulnerability; Adaptive strategies, North Kordofan; Sudan

Climate change has enormous impacts on natural and human systems (IPCC 2001; Kanninen *et al.* 2005). Moreover, climate change is considered to be a major threat to terrestrial and aquatic ecosystems with subsequent impacts on agriculture and food security, health, infrastructure...etc. Extreme weather events such as storms, floods, droughts and increasing temperatures will add more stress to the global social-ecological systems. The multiple impacts of climate change vary across regions and across different sectors. Sub-Saharan Africa and other regions in developing countries are highly vulnerable to the impacts of climate change (IPCC 2001; IPCC 2007; Brooks *et al.* 2005; Ravindranath 2007). Therefore the study objectives were to explore the climate change experienced based on the perception of rural household and to explain the adaption strategies for the rural households.

Random sampling was used to select 100 forest-dependent households in Um-Rawaba Locality and 100 households in Sheikan Locality in 2011. The primary data were collected using the following techniques: (i) structured questionnaire; (ii) key informant interviews; (iii) field observations. The data were analyzed using SPSS program version 16. Descriptive statistics were applied for results demonstration.

Rural households observed variations in terms of temperature and sunshine (96%), rainfall (99%), diseases and pests (5%), sowing period (12%), water resources (8%) and harvesting period (2%). These findings are similar to Ionescu *et al.* (2009) who reported that exposure to climate change impacts are changes and variations in temperature, rainfall, seasonal patterns and climate sensitive and related resources and activities. Local people described the present situation as climatic accident. The inherent variations of climate from year to year and from season to season, make variability an integral part of climate change (Berz 1999).

Farmers complained of a distortion in the different stages of crop production such as farm preparation, planting or sowing, farm maintenance and harvesting. Abortive germination of crops was a major complaint from farmers, as a result of unexpected sunshine and temperature during periods initially observed for rainfall. The farmers also complained of poor harvest and they attribute that to prolongation of the rainy season. However, this relationship needs to be verified. In addition, certain crops were left in the farms, for preservation against post-harvest losses, but prolonged rainy season makes this method difficult nowadays. This situation was worse with limited preservation resources and lack of preparedness. This has immense impacts on income generation from crop production (Kurukulasuriya and Rosenthal 2003).

The study results revealed that adaptation strategies to weather-related disturbance across the study areas were: selling of assets, saving, reliance on social networks, feeding on wild plants and animals and temporary migration (Table 1). The study findings are similar to Adger (2003). The percentages of households who depended on selling assets to face the changing climate were 60% and 90% in Um-Rawaba and Sheikan

localities, respectively. These assets included animals and land. Saving is another adaptive strategy by the household in Um-Rawaba Locality (20%) and Sheikan Locality (30%). Respondents used the term saving in two ways: during impact saving meant using less amount of available resource during climatic crisis, eating less food, using less feed and reducing purchases. The second type is pre-impact saving whereby households keep sufficient assets (crop, forage, livestock, money or other forms of assets) that help them to bridge hardship times. According to the respondents, after facing perilous income and food deficits in the recent droughts and rainfall delays, pre-impact saving became their main strategy. During the field work heaps of crop-residue around house yards were observed. In addition to managing household food consumption to pay-off expenses and to fulfill household financial requirements, the households sold livestock instead of food crops.

Table 1. Forest-dependent household's adaptive strategies to climate change across the study areas

Response	Percent of households* by locality	
	Um-Rawaba	Sheikan
Selling assets (including animals, land)	60%	90%
Saving	20%	30%
Reliance on social networks	78%	93%
Eating of wild plants/fruits	40%	66%
Feeding of wild animals/birds	30%	0%
Migration	60%	70%

*Households adopt perform more than one type of response

The existing coping strategies showed that even the marginal groups of the society were found using one or more strategies to enhance their resistance against the crisis. The significance of social interconnectedness and informal associations seen in the study areas was also prevalent in Ethiopia where the informal social associations played a pivotal role in sustaining kinship and lineage ties, which are necessary for security in times of crisis (Adger 2006).

However, the currently available coping strategies were not sufficient, particularly for the majority of surveyed households as all societies were vulnerable to different socioeconomic challenges. Vulnerability was further exacerbated by other internal and external stressors. It seems surprising that 89% and 90% of the interviewed households in Um-Rawaba and Sheikan localities, respectively, suggested that unavailability of government support and selected crop variety; water shortage and landlessness/unemployment are their overarching stressors that exacerbated their vulnerability to climate change impacts. This result showed that the three stressors were serious and priorities for the livelihood and adaptation capacity of the households in study areas.

Community perceptions indicated that they were vulnerable to the variation in local climatic conditions, with noted variations in temperature and sunshine, rainfall, and other climate sensitive schedules such as sowing periods and harvesting periods. The adaptation strategies to weather-related disturbance across the study areas were: selling of assets, saving, reliance on social networks, eating wild plants and animals and temporary migration

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تأثيرات تغير المناخ و إستراتيجيات التأقلم في ولاية شمال كردفان (السودان)

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المستخلص: هدفت الدراسةالى تحرى تأثيرات تغير المناخ بناءاً على إدراك المجتمع الريفى وتوضيح إستراتيحيات تأقلم الأسرة الريفية. جمعت البيانات الأولية بواسطة المقابلات المعدة، مقابلات مفاتيح المعرفة و المشاهدات الحقلية، كما جمعت البيانات الثانوية من التقارير. أستخدمت تقنية المسح العشوائى لإختيار 200 رب أسرة معتمدة على الغابات فى كل من محلية أم روابة (100 رب أسرة) و محلية شيكان (100 رب أسرة) فى شمال كرودفان. تم تحليل البيانات بإستخدام برنامج الحزم الإحصائية للدراسات الإجتماعية (SPSS). أستخدم الإحصاء الوصفى لمعرفة الإستجابات السائدة بين أرباب الأسر. دلت نتائج الدراسة على أن أرباب الأسر متأثرة بالتغيرات المناخية المحلية إعتماداً على إدراكها. أهم إستراتيجبات التأقلم على تغير المناخ هي بيع الممتلكات، الإدخار، الإعتماد علي العلاقات الإجتماعية، أكل النباتات البرية ، الثمار البرية، الحيوانات البرية و الهجرة المؤقتة.