Doctoral Dissertation

Factors Affecting Climate Change Adaptation in Agriculture in Central and Western Tarai of Nepal

(Summary)

SHREE KUMAR MAHARJAN

Graduate School for International Development and Cooperation
Hiroshima University

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Agriculture is considered as the most severely affected sector from the impacts of climate change. Farmers in the grassroot levels have also experienced the impacts and attempted to deal with it based on traditional knowledge and experiences. It has two-way relationship with climate change as agriculture sector also contributes in greenhouse gases emissions. This study has focused on exploring and analyzing the impacts of climate change in agriculture mainly focusing in the Central and Western Tarai of Nepal through the use of multiple research methodologies. The research in climate change generally connotes to the analysis of quantitative data such as climatic trend analysis (rainfall and temperature), vulnerability assessments, model analysis, predictions and forecasting future trends. However, in recent years the qualitative and participatory researches are also getting momentum. This study has combined both methodologies including the policies, practices and perceptions analysis.

Despite the least contributions to the global greenhouse gases emission, Nepal is in the top ranked countries to face the impacts because of poverty, high dependence on natural resources and least adaptive capacities. Government of Nepal (GoN) has developed number of policies, plans and strategies to address the impacts of climate change at the national and local levels. There are multiple researches focused on climatic trends and vulnerability assessments in Nepal. Only few researches focus on climate policies and plans in Nepal. None of the researches have focused on analyzing the policies/plans, practices and perceptions relating to climate change adaptation till date. Thus, this study has focused on analyzing the factors that affect the policies, plans and strategies of climate change including the practices, perceptions and roles of the people and institutions in the local and national levels.

The sustainable livelihood framework is the most commonly used framework in assessing vulnerability of rural livelihoods to climate change. This study has adapted it to analyze the factors of climate change particularly in

agriculture which either influence or constrain climate policies/plans, programmes and practices including the perceptions of people and institutions at the national and local levels including the household level. The assumption of the study is that the livelihood assets such as natural, financial, physical, social and human capitals and additionally policy and technological aspects/factors directly and indirectly influence the climate change and adaptation at the national and local levels. These factors are trickled down to the household level into age, gender, ethnicity and family size as social factors, occupation and land holding size as the economic factors and economically active population per household, education, training and awareness as the human capital. Furthermore, the research questions are concentrated on the factors of climate impacts and adaptation at household level, trends and frequencies of climate, coping and adaptation practices, roles of communities and stakeholders.

The overall objective of this study is to explore and analyze the factors affecting climatic risks, vulnerabilities and climate change adaptation especially focusing on agriculture sector at the national and local level in Nepal. The specific objectives are review and analysis of climate policies/plans and strategies at national and local levels; analysis of climate risks and vulnerabilities at local level, analysis of needs and priorities for climate adaptation, analysis of perceptions and factors of climate adaptation at the household and community levels. Both qualitative and quantitative data and methodologies are combined, as appropriate in this study. The study has been concentrated in Madi valley of Chitwan district and Deukhuri valley of Dang district in Central and Western Tarai of Nepal respectively. The districts were selected based on national vulnerability index carried out by the government whereas the specific study locations within the districts were selected in consultation with the local partners, stakeholders and review of district and municipality reports. Finally, the ward Numbers 4, 5 and 6 of

Madi Municipality, Chitwan district (used to be Baghauda VDC in the past) and Sisahaniya and Gadhawa rural municipalities in Deukhuri valley, Dang district were selected for the study, especially for focus group discussions (FGDs) and participatory researches, household surveys, key informant interviews (KII). The national level survey was done via online questionnaire survey applying the delphi research technique. The review was carried out and will continue throughout the study from conceptualization to the final printing of the dissertation.

The key findings of the study can be summarized based on the specific chapters. The first chapter deals with the background, problem statements, rationale of study, conceptual framework, research questions/assumptions, objectives and review of previous researches, brief methodologies and major expected outcomes. The second chapter covers the review of climate policies, adaptation practices, perceptions and roles of local institutions. The review of climate policies specifically revealed mainly National Adaptation Programme of Action (NAPA-2010), national climate policy (2011 & 2019), Local Adaptation Plan of Action (LAPA-2011) and National Adaptation Plans (NAP) as adaptation related policies/plans in Nepal. This chapter basically analyzes the adaptation practices in 5 different categories – mobility, storage, diversification, communal pooling and market exchange. Most of the adaptation practices in agriculture in Nepal can be incorporated in these categories. Different institutions (public, private and civic) have specific roles in these categories of adaptation practices. It is also revealed that multiple factors such as policy, socio-economic, physical, natural and institutional factors directly or indirectly associated with these adaptation practices and perceptions.

The third chapter mainly focuses on the research methodologies particularly in climate change adaptation in agriculture. It has adopted the systematic review methodology to analyze the number of papers published in Science Direct (SD), Springer Link (SL) and Web of Science (WS). It followed the stepwise methodological

procedures with inclusion and exclusion criteria to select the papers for review. The inclusion criteria defined with the keywords 'research methodologies in climate change adaptation in agriculture in the open access journals published in SL, SD and WS. Furthermore, only the research papers in English within the timeframe of 2010-2017 were included. It is revealed that quantitative research (48.64%) is actually dominating as compared to qualitative 27% and combined research (24.32%) in climate discourse. Most of the researches are at the national level (56.75%) as compared to the regional, sub-regional and local level. Diverse research methodologies with the use of model analysis and trend analysis. Both methodologies have specific importance and use, thus, the combination of both qualitative and quantitative data and methodologies have been planned for this study.

The chapter four focuses on the policy survey with the national climate experts, which revealed that the GoN have emphasized and prioritized on climate policies, plans, strategies and programmes/projects at the local and national levels since 2010. It is observed that the concerned stakeholders actively contributed in the formulation of these policies and plans, which is not continued in the implementation process. The climate related policies, plans, strategies, frameworks, programmes and projects are in the hierarchical order in business as usual, but in National Adaptation Programme of Action (NAPA) was formulated prior to the national climate policy. Recently the new climate policy has been formulated after the declaration of the country as a Democratic Republic Country. Many climate experts in Nepal criticized the government for not being independent in formulating the climate policies and plans as they believed it is driven by the international climate agreements, negotiations and the donors providing the funding supports, which may be true to formulate NAPA in advance to the national climate policy as it is not common in most of the cases.

Nevertheless, most of the experts agreed that there are positive linkages between national climate change policy,

NAPA and LAPA framework. Most important and innovative policy i.e., Local Adaptation Plan of Action (LAPA) is formulated in the country driven process as Nepal is very diverse in terms of geographical and climatic variations. NAPA wouldn't be effective without specific LAPAs to address the local climatic variations. However, the LAPA formulation and implementation processes are very slow and ineffective because of ongoing political transition phases. In fact, some experts even doubted about the capacity of the local government to develop and execute it without the support of national government and contribution of the stakeholders. Some of the local adaptation plans developed in Western Nepal from 2011-2015 needs to be upgraded because of change in the geographical boundaries and local governmental/administrative units after the election in 2017.

It is also revealed that the sectoral policies, plans and strategies such as national REDD+ and local carbon economic development strategies have also integrated the adaptation by the sectoral ministries and concerned departments. Almost all experts participated in the survey agreed on progressive and positive development of climate policies, plans and strategies in Nepal. However, few of them unveiled the infancy stage of it and lack of reliable and scientific data and capacities to implement the policies, plans and strategies effectively. Furthermore, there is uncertainty of the available sources of budget for its implementation, despite the development of budget code developed by the ministry of finance and national planning commission. Some of the experts also argued the seriousness of the government to implement these policies, plans and strategies because of unstable government, especially changing or merging of ministry of environment with different sectoral ministries sometimes with the ministry of population, with ministry of science and technology and ministry of forestry etc. Furthermore, there is also lack of clarity on the fund disbursement, though it has specifically mentioned about 80% budget at the local level implementation. There is also an issue of capacity to absorb and effectively utilize

the disbursed amount. It may lead to the corruption at the local and national level. In that regards, the stakeholders at each level need to play crucial role of watchdog to effectively utilize the resources and minimize the corruptions and other issues. The political and institutional factors are highly influential in Nepalese climate policies, plans and strategies in comparison to the other factors. Furthermore, the specific indicators for the policies, plans, strategies, frameworks and programmes/projects are needed to monitor the effectiveness and progresses.

The chapter five has emphasized on the participatory vulnerability assessment of the climate risks, hazards and impacts in the study sites. Since the study sites lack the meteorological stations within the boundary and its periphery, it is worthwhile to document the farmers' and local stakeholders' perceptions through participatory approaches. Multiple tools and methodologies such as historical timeline, hazard mapping, seasonal calendar, vulnerability assessment, forced field, vulnerability matrix, stakeholder identification among others have been applied for documenting their perceptions towards vulnerabilities, exposures, sensitivities and adaptive capacities. From this approach, it is found that the climatic exposures and sensitivities have been increasing over the years due to both climatic and non-climatic factors such as wildlife attacks in case of Madi valley. Furthermore, women, elderly and children are affected the most from the impacts. Adaptive capacities have been increased because of number of training and awareness raising activities. The natural and policy factors influenced the most since these factors are beyond the access and control of the farmers as per their perception in Madi valley.

Likewise, the chapter 6 has emphasized on the perceptions and influences of the local stakeholders in climate change adaptation at the local level through the key informant interviews (KII). Local level stakeholders have significant roles in local climate adaptation policies, plans and practices. Thus, it's important to assess and understand their perceptions and influences in the adaptation process. This study also concentrates on the

governance model (either the position-based or interest- or issue-based) in the changing political context for the effective climate policies/plans and practices at the local level. It is revealed that interest- or issue-based governance model would be effective in the current political context with the power sharing among the stakeholders at the local level. Different stakeholders have different interests and thematic focuses based on which they would be contributing in the climate adaptation at the local levels. For instance, government organizations, being public agencies, especially contribute in policy/plans, training, awareness and livelihood supports, whereas farmers' groups and cooperatives contribute in resource generation & mobilization, coordination and networking at the local level as it is considered as civic categories. Likewise, the I/NGOs and private agencies specifically contribute in research, training and awareness, livelihood supports and adaptation interventions. Furthermore, some of these organizations are highly influential, for instance, the government counterparts and some of them are influenced i.e., mainly the farmers groups and cooperatives.

The 7th chapter concentrates on the analysis of household-level factors affecting climate change adaptation, which was based on the household survey conducted with the 154 samples in Madi valley and 150 samples in Deukhuri valley. The main purpose of the chapter is to analyze the socio-economic factors that either influence or restrain the farmers adaptation choices at the household level. Based on analysis, it is revealed that crop diversity, education, training and total land holding (acre) were positively significant for adaptation choices the study sites. Rest of the variables were not significant though indicated positive as expected except age, occupation, ethnicity, family size, and access to credit. Furthermore, the factors for riverbed farming (one of the adaptation interventions in Deukhuri valley was also analyzed, which indicates that education and occupation (i.e., mainly farming in this case) are positively significant, but family size is negatively significant. The chapter is divided

into background, methodology, key results and discussion and conclusion.

The 8th chapter presents the conclusions and recommendations of the overall research on factors affecting climate change adaptation in agriculture in Nepal. The 9th chapter covers the team project and its findings during the onsite team project specifically being a Taoyaka student. It mainly focuses on the integration of information, communication and technology in climate education in Nepal and Myanmar. However, this chapter presents the findings of climate education at the schools in Myanmar. This chapter explores the introduction of Information, Communication and Technology (ICT) into the classes by conducting a randomized controlled experiment (RCT) among secondary schools in urban Myanmar. Using a lecture on climate change awareness, 942 students in five schools in Yangon and Mandalay participated in the experiment. For treatment groups, the lecture was video based, with the teachers simply providing support to the contents of the video. In contrast, the teachers in the control groups presented the content of the video lecture without the video-aid. Students learning outcomes for those in the treatment group resulted in a mixture of outcomes divided on gender lines. The study suggests that ICT can simultaneously benefit certain students while impeding others, and thus should not be treated as a panacea to improve learning outcomes.