



International Conference of Sabaragamuwa University of Sri Lanka 2015 (ICSUSL 2015)

Adaptation to climate change by smallholder farmers in rural communities: Evidence from Sri Lanka

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Abstract

The agricultural sector plays a key role in Sri Lankan economy, whose major source of livelihoods is smallholder farming in paddy and vegetable cultivation which is highly vulnerable to climate changes having negative impact on food security. To overcome the welfare losses, the smallholder farmers need to identify the changes in climatic variables and adjust to their farming practices to cope up with the climate change. Thus, this study examines how rural smallholder farmers in different agro-ecological zones in Sri Lanka perceive climate change and accordingly adapt to it in their agricultural practices. A questionnaire survey was conducted with a random sample of 125 farmer households distributed in most vulnerable four agro-ecological zones namely, Belihuloya, Ihala Galagama, Mulgama and Kosgama in up country inter mediate zone. The study shows that all the respondents have observed rising trends in temperature and winds and lack of adequate rainfall during last twenty years and in response they have grown short season crops as the main farming practice to adapt to minimize the potential losses on their yields. The results of the logistic regression revealed that social economic factors, environmental factors, institutional factors and the economic structure influence farmers' choice of adaptation methods to climate change. The size of the household, income, education, accessibility to climate information through television and radio, being a member in farmers' group, location of the land, crop variety, access to formal loans and distance to input markets had significantly affected adaptation. For instance the farmers who grow beans as the major crop to adapt to climate change has 94% probability with compared to those farmers who do not grow other crops whereas the farmers who come to know the changing patterns of the climate through television and radio have a higher probability (94%) of adaptation to the climate change than those who use other media. Sri Lankan government requires facilitating the smallholder farmers to overcome the constraints in which they face in using adaptation methods to climate change so that the welfare of the farmers and growth of the agricultural sector can be ensured.

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Peer-review under responsibility of International Conference of Sabaragamuwa University of Sri Lanka 2015 (ICSUSL 2015).

Keywords: Adaptation methods; climate change; logistic regression; smallholder farmers; Sri Lanka

1. Introduction

Climate change is one of the crucial factors which threaten the agricultural sector for decades and the sector is more sensitive to climatic conditions. The agricultural sector contributes 10.9% to the GDP and 31% of the population is employed and remained as the main source of livelihood for rural communities in Sri Lanka. The majority of the population (77.4%) lives in rural sector where farming is extensively practised. Sri Lanka, a tropical nation, is highly vulnerable to impacts of climate change and the climate of Sri Lanka is undergoing three major types of changes, gradual increase in air temperature, changes in pattern of rainfall and increase in frequency and severity of extreme weather events such as floods, droughts and winds. The impact of climate change on agriculture production differs from one country to another and several studies confirm that climate changes negatively impact on agriculture^{1&2}. The rural level smallholder farmers are severely influenced by climate change as they have the low adaptive capacity to climatic change.

Adaptation to particular climate changes seem to be the most appropriate and responsive way for farmers to lower the negative impacts of climate change as it is the mean of transmitting the outcome of the farmers perception on climate change³. In Sri Lanka, some scholars point out that adverse impact of climate change on agricultural production could be minimized by applying suitable adaptation strategies such as introduction of micro irrigation, changing planting dates, reduction of irrigation depth and crop diversification⁴. Few studies propose that changing planting time to suit rainfall variability⁶ and introduction of micro irrigation⁵ are the best adaptive methods to minimize the negative impact of climate change.

The agricultural measures such as the use of improved crop varieties, planting trees, soil conservation, changing planting dates, and irrigation are the most widely used adaptation strategies whereas several socio-economic, environmental and institutional factors and the economic structure are key drivers influencing farmers to choose specific adaptation methods⁷. However, in Sri Lanka, such studies in different ecological zones are lacking and need a rise to recognize the capacity and drivers of adaptation to climate change predominantly amongst smallholder farmers in rural community in Sri Lanka in order to implement appropriate policy measures to strengthen the accessibility of the different adaptation methods. Thus, this study will address to the research question “How do smallholder farmers in Sri Lanka perceive climate change and adjust their farming practices to cope with the changes in climate?”

2. Methodology

2.1 Materials and Methods

A cross sectional household survey was carried out using a semi structured questionnaire and face-to-face interviews. The questionnaire consists of five parts one each for demographic characteristics, environmental factors, institutional factors, and the economic structure and methods of adaptation to climate change and constraints for implementing any adaptations strategies by smallholder farmers. Most prominently, the farmers were asked to compare the climate conditions of past twenty years with respect to mean and variance precipitation and temperature. If they had observed changes they were later inquired with reference to ways in which they had taken actions to the perceived climate changes. The questionnaire was pre-tested with ten farmers in Belihuloya and Mulgama agro-ecological zones.

From the up-country inter mediate zone, four agro-ecological zones were selected namely, Belihuloya and Ihala Galagama from Imbulpe Divisional Secretariats, Mulgama, from Balangoda Divisional Secretariats and Kosgama from Haldumulla Divisional Secretariats. The study first adopted the stratified sampling technique based on agro-ecological zones and selected four zones. Next, the sample was randomly drawn from the selected agro-ecological zones. The number of farmers interviewed was 50 out of 116 from Kosgama, 18 out of 60 from Mulgama, 26 out of 78 from Ihala Galagama and 31 out of 82 from Belihuloya.

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