

Executive Summary

Vietnam is a low-latitude country with a lengthy territory that stretches from north to south and includes a variety of geographical characteristics such as river deltas, mountains, coastal regions, and highlands. Despite its rapid economic growth, the agriculture sector continues to account for a significant share of the national economy and exports. Due to this feature, Vietnam is regarded as one of the countries most vulnerable to climate change. This multidisciplinary study examines the impact of climate change on Vietnam's economy and national welfare, particularly in the agricultural sector, and identifies acceptable climate change adaption measures and factors that boost their acceptability. For the purpose of this study, a research partnership with Vietnamese researchers was established and utilized.

This study consists largely of three topics, of which the first section is a crop study that identifies the best-suited crops for each region through spatio-temporal analysis of changes in climate suitability for major crops, while taking into account Vietnam's regional vulnerability to climate change and economic value. The subsequent five in-depth studies comprise the second section: 1) An econometric model is used to analyze and project the effects of climate variables and other variables such as topographical and geographical characteristics on crop selection. 2) A dynamic general equilibrium model (CGE model), which incorporates variations in productivity of major agricultural products caused by climate change, is constructed and examined to estimate the national cost of climate change. 3) Income changes, welfare losses, and changes in the percentage of the poor are estimated by a micro-simulation study, which incorporates future labor, capital income, and product prices presented by the CGE model and the Vietnamese household survey data. 4) An analysis of consumer welfare impact caused by variations in agricultural prices due to climate change was conducted by estimating a demand system using micro-consumption data at the household level. 5) The impact of climate change on income growth and convergence

by region is studied by developing and applying an econometric model using household-level survey data. The last section includes two detailed studies: 1) Results of a survey, conducted on areas vulnerable to climate change, are analyzed to identify factors which influence farmers' decision to respond to climate change regarding production and distribution, and 2) to examine the impact of climate change response on quality of life, such as household income, health, and vulnerability.

Crop suitability analysis revealed that, in the northern regions such as Northern Midlands & Mountainous Area and the Red River Delta, the climatic suitability of maize will relatively increase while the suitability of rice will somewhat decline as a result of climate change. The suitability of peanuts rose in the central regions of the country, and there was a tendency to expand inward from the coastal areas. For Central Highlands, area of land with high suitability for Robusta coffee decreased, whilst rice was still identified as the optimal crop in the southern regions. Econometric analysis on the impact of climate variables on observed crop selection behavior in each region significantly supports the findings of the above crop suitability research. According to the results of econometric analysis, the impact of future climate change on crop selection will vary by location, and in many regions, initially, the proportion of rice cultivation area will not change significantly, but subsequently fall significantly.

Additionally, it has been shown that by implementing effective adaptation measures, the social costs of climate change can be greatly reduced. According to the CGE analysis, if Vietnam were to implement relatively lax adaptation measures compared to other countries/regions, it is likely to result in higher GDP losses than any other countries/regions in the world. With active climate change adaptation measures, however, losses will be reduced to only 1% of GDP or less, even in the case of a relatively bleak climate change scenario, demonstrating the importance of adaptation. Furthermore, even though consumer welfare loss was estimated to be 1.8 to 5.1% (price in 2040) and 3.37 to 6.12% (price in 2070) of the total food expenditure per household, the loss was reduced to half when active climate change adaptation

measures were in place.

Income distribution is also affected by climate change. Results of analysis that utilized sources of household income indicate that climate change improves income distribution when the proportions of agricultural income and other income increase, while in the case of increasing proportion of earned income, it exacerbates income distribution. Moreover, statistical analysis shows that climate change has affected the rate of convergence of income by region, and also confirms that the rise in daily minimum temperature and precipitation fluctuations have had a negative effect on income distribution by lowering the rate of income convergence.

Following the result of the survey conducted in this research, it was found that the selection of climate change adaptation measures is influenced by both individual behavior control and whether that behavior is socially desirable. Additionally, it was discovered that social capital fosters climate change response through both direct and indirect channels, with the intensity of response increasing in accordance with the level of wealth prior to climate change. Individual characteristics of farmers, such as age and education level, were found to have a significant effect on the implementation of certain adaptation measures, and these characteristics were found to have a significant effect on the farmers' quality of life as well.

Based on the findings of the preceding analyses, this study concludes that 1) appropriate adaptation measures play an important role in improving economic growth, income distribution, and quality of life, 2) removing barriers, especially in the case of crop switching, is necessary for the introduction of effective adaptation measures, 3) support for vulnerable population and regions should be emphasized, 4) investment and assistance is required for the development of adaptation capability of residents in vulnerable regions, and 5) future research should focus on basic data acquisition and continuity.