

**Supply and Demand of Rice in Cambodia: Effects of Climate Change  
and Mitigation Option**

May 2017

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and Mitigation Option

A Dissertation Submitted to  
the Graduate School of Life and Environmental Sciences,  
the University of Tsukuba  
in Partial Fulfillment of the Requirements  
for the Degree of Doctor of Philosophy  
(Doctoral Program in Appropriate Technology and Science  
for Sustainable Development)

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## **ABSTRACT**

Many studies have shown that climate change affects crop yields. Meanwhile, price of rice in Cambodia has increased between year 2000 and 2009 and significantly increased between year 2008 and 2009, which affects the consumption of rice in Cambodia. Although there is a rapid growth in rice production between year 2000 and 2006 due to the introduction of good rice varieties, there is still not enough food for all people in Cambodia. In addition to a severe drought in 2004, there is a big gap between different income groups. Hong and Furuya (2016) mentioned that rising price of rice particularly affects the marginalized groups of people, especially the landless and land poor because they are the net consumers of rice. Statistically, rice production has almost doubled from year 1998 to 2007 due to the improved technology as well as irrigation expansion. There is still a huge potential of land to be irrigated in Cambodia according to Kean (2012). However, irrigation development and management is not the prompting focus of the Royal Government of Cambodia. There have been quite a number of studies on climate change on agricultural sector over the world, but not many have focused on such a vulnerable country as Cambodia where a large number of people of more than 80% is highly dependent on the favor of climate for agricultural activities. (Trading Economics, 2014)

The objective of this study is to measure the impacts of government's irrigation stock on price of rice and supply and demand of rice as well as to quantify the impacts of climate variables and irrigation investment on the endogenous variables in the supply and demand models.

To evaluate the impacts of irrigation on yields, areas, production, consumption and market of rice, this study employed supply and demand model of agricultural products as an aid in analyzing demand and supply of rice and equilibrium price of rice for the suppliers and consumers. Moderate climate change scenario RCP 6.0 in combination with socioeconomic scenario SSP2 were used. The models comprise functions of yields of wet and dry season rice, areas of wet and dry season rice, import of rice, stock change of rice and demand of rice. Climatic variables, which include temperature, precipitation and solar radiation, were incorporated into functions of yields of wet and dry season rice and areas of wet season rice. Government's irrigation stock was included in the area of dry season rice to evaluate its impact on area of dry season rice, production and consumption of rice as a whole. Comparative statics analysis was used to evaluate the indirect impacts of changes in climatic conditions and government's irrigation investment on yields, areas, production, import, consumption and price of rice. Two assumptions of irrigation investment scenarios were made to derive its effects on the endogenous variables. One is the scenario of which the government irrigation stock keep increasing, while facing 10% depreciation each year (*GS*). The other is the scenario of which the government irrigation stock stays constant and has 10% depreciation every year (*GS0*). Comparative static analysis was also used in this study to derive the indirect impacts of changes in climatic variables and irrigation on the endogenous variables in the model.

The estimation results of simultaneous equation models show that people's income is not elastic to the demand of rice. Increase in income by 10% would cause 1.7% increase in the demand for rice. If rice price increases by 10%, the demand for rice will decrease by 4.3%, but increase by 1.4% when maize price hits a 10-percent increase. Increase in government' irrigation stock by 10% would contribute to 0.5% of paddy dry area expansion. The simulation results show that under the increasing irrigation stock scenario,

people would have more widely availability of rice to consume and the price of rice is predicted to be more affordable comparing to the baseline scenario of which irrigation investment is not increased. The results imply that government investment irrigation is effective in lowering the price of rice, which is predicted to increase due to climate change.

From comparative statics analysis result, among all climatic variables, temperature in September, which is included in the yield function of wet season rice, is the most sensitive climate variable to rice yields, areas, import, production, consumption and price. The rise in temperature causes dramatic changes to the endogenous variables. It causes an increase in yield and production of rice. However, in the long-run, this result would change. It was also found that the indirect impact of the government's irrigation investment is positive for stock change of rice in the comparative statics study, so the farm price of rice is reduced.

Temperature in September was found to be the most responsive variables to yields, areas, productions, import, stock change and demand of rice and positively influential factor for yield of wet season rice. However, too much increase in temperature would badly affect yields and productions of rice. It is suggested that climate change-resilient rice varieties be introduced to farmers to adapt to climate change. From the results of simulation and comparative statics, it can also be concluded The government's investment in irrigation is crucial for people to have more access to rice and for reducing price of rice fluctuation as one of the important mitigation measures in Cambodia. The agricultural policy in Cambodia is suggested to focus mainly on rehabilitating irrigation systems since water is the main factor for growing rice.