

# Food System Resilience and Sustainability in Cambodia

Joseph Messina, Department of Geography, Environment, and Spatial Sciences, Michigan State University, East Lansing, MI, USA

Tanita Suepa, Geo-Informatics and Space Technology Development Agency (GISTDA), Bangkok, Thailand

Sieglinde Snapp, Department of Plant, Soil and Microbial Sciences, Michigan State University, East Lansing, MI, USA

Jennifer Olson, Michigan State University, East Lansing, MI, USA

A. Pouyan Nejadhashemi, Department of Biosystems and Agricultural Engineering, Michigan State University, East Lansing, MI, USA

Sarah Murray, Michigan State University, East Lansing, MI, USA

Nathan Moore, Department of Geography, Environment, and Spatial Sciences, Michigan State University, East Lansing, MI, USA

April Frake, Department of Geography, Environment, and Spatial Sciences, Michigan State University, East Lansing, MI, USA

Peilei Fan, Michigan State University, East Lansing, MI, USA

Umesh Adhikari, Department of Biosystems and Agricultural Engineering, Michigan State University, East Lansing, MI, USA

## ABSTRACT

Cambodia is witnessing a “Goldilocks moment” in demographic change concurrent with shifts in land use, hydrology, and climate. These trends interact and affect food production, food costs, and food security. Drivers of these trends are typically examined separately with interacting factors considered along disciplinary margins. While science models to explore these interacting effects have been proposed, there remains an applied research gap in integrating these pieces and assessing interdisciplinary opportunities for developing food security solutions. Developed following a request from USAID to elucidate food security conditions in Cambodia, here the authors present their geospatial synthesis of the biophysical and socioeconomic drivers of current food security risk, as well as explore future trends for those conditions. The overall structure shows several interlocking or mutually reinforcing trends in systems that point towards a significant intensification of food insecurity in the near future. They offer an assessment of future targets for food systems innovation.

## KEYWORDS

Cambodia, Climate Change, Food Security

## INTRODUCTION

Since 1990, substantial progress has been made in the fight against global hunger, yet the state of hunger in many developing countries remains at a critical level. According to the Food and Agriculture Organization of the United Nations (FAO), 805 million people still suffer from undernourishment, many of whom are small-holder farmers, dependent on agriculture (GHI, 2014). In recent years, food insecurity exacerbated by continuous population expansion has placed a much greater emphasis on the

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global agricultural sector in an effort to expand production. Yet what remains to be fully understood are the direct impacts on global, national, and local food systems in light of a changing climate where unpredictable precipitation patterns and droughts influence annual agricultural yields. As climate patterns continue to shift, so too will the geographic distribution of vulnerability and risk for food insecurity. As such, a growing emphasis exists on the development of actionable adaptation strategies aimed at improving food security conditions in light of changing climatic conditions.

Across South East Asia, climate change is one of the most significant synoptic drivers of population scale risks in vulnerability, resilience, and adaptation. In climate change adaptation research identifying actionable research is critical. It is relatively easy to identify well-known but generally intractable problems; however, these fail to offer effective guidance for donor institutions. In this study, guidance regarding the most pressing gaps in knowledge, methods, and data that stand as obstacles to improving food security under climate change conditions are considered for the country of Cambodia, one of the poorest countries in South East Asia. A tractable innovation pipeline, presented as a list of action items is presented by precedence and potential impact. While not meant to be exhaustive, the innovation pipeline presented herein is meant to offer suggestions for mitigating future food insecurity issues directly linked to a changing climate.

## **CAMBODIA**

Cambodia is located in the southern portion of the Indochina Peninsula and shares borders with Vietnam, Laos, and Thailand, with the Gulf of Thailand to the south. Consisting primarily of low plains, the region is bounded by a highland region formed by two distinct upland blocks, the Cardamom Mountains and the Elephant Mountains that cover much of the area between the Gulf of Thailand and the Tonle Sap in the southwest. Elevations exceed 1,500 meters only in the Cardamom range in the southwest and in the Annamite range on the borders in the northeast. Tonle Sap Basin, the Mekong Lowlands, and the Mekong Delta cover roughly 75% of the country with elevations usually less than 100 meters above sea level. The coastal zone in the southwest of the country has a total length of 435 km. Human modification of the Mekong is having significant impacts on the Tonle Sap seasonal flooding (Kummu and Sarkkula 2008) and follow-on effects for the ecosystem as a whole (Arias et al. 2014).

## **LAND COVER CHANGE**

Outside of the densely populated plains the land is mostly forested, and a large percentage of that land has protected status. Indigenous communities reside in these areas but do not have clear land tenure rights. Land tenure remains a controversial issue. Many property deeds were destroyed in the 1970s civil war, and it is estimated that only one-third of the agricultural population has proper title. Recent land concessions to large-scale private agro-industrial entities have increased feelings of land tenure insecurity, potentially affecting rural settlement patterns (Kizlovkis 2014).

In recent years the extent of forest and other wooded land has fallen rapidly due in part both to deforestation and the conversion to agro-industrial crop plantations such as rubber, oil palm, cassava and jatropha, as well as sugar cane and biofuel crops (Bansok et al., 2011). Figure 1 shows an assessment of areas of forest change and the main reason for the forest cover changes (Broadhead & Izquierdo, 2010).

Agricultural expansion and the majority of areas converted are listed as having been primary forest. Almost half of the sites recorded were in protected areas or national parks. Between 1965 and 2010 forest cover in Cambodia fell from 73% to 57% of the total land area (12,944 to 10,094 thousand hectares) (Figure 2) (Bansok et al., 2011). Most areas of forest loss in Cambodia are in the hilly zones and along the mountain ranges with evergreen and semi evergreen forests (Broadhead & Izquierdo, 2010). In addition to the reduction in area of forest, the quality of forests has declined.

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