

Climate Effects on Tea Quality and Socio-economic Responses Summary

Objective: This study addresses critical knowledge gaps related to climate effects on crop quality and their corresponding socio-economic responses (Figure 1). The proposed project uses tea production and consumption systems as a case study to explore complex interactions between human and natural systems. Our primary study objective is to provide quantitative data on *how* and *why* tea quality is vulnerable to changing climate conditions and the resulting linkages to consumer purchasing decisions, markets, farmer livelihoods, ecological knowledge and management practices.

Summary of Approach: Our overarching research question: How are links between tea agro-ecosystems, consumers, markets and farmers impacted by increased climate variability and what are the resulting socio-ecological feedbacks? Our research questions and objectives are centered on the integrative natural and human components and processes of tea production and consumption systems and the exogenous climate and market factors that influence these systems. This study brings together an interdisciplinary team to address research questions through field sampling, controlled experiments, laboratory analyses, consumer and farmer surveys, database and archival research and modeling.

Intellectual Merit: The integration of climate, biological, chemical, socio-economic and cultural data is expected to enhance the theoretical understanding of human-environment relationships. The novel ethnographic narrative models and empirical predictive models that we will construct from generated data will elucidate dynamics of climate change, agro-ecosystems, markets and farmers practices and contribute to literature in these areas. Altogether, this study is expected to inform management of tea agro-ecosystems, to serve as a research model to investigate other crops of global significance by simultaneously considering social, economic, and environmental systems, and lead to the development of new theory and methods for interdisciplinary scholarship.

Broader Impacts: Research findings will be applied for societal actions to facilitate economic sustainability of farmer livelihoods and environmental sustainability of agro-ecosystems by developing evidence-based management plans and policy suggestions. In addition, research findings will be disseminated through a multi-pronged strategy targeted at diverse audiences in the study region and globally including: (i) resource management recommendations to inform land-use organizations and policy, (ii) development of a web-accessible database linked to information technology networks, (iii) creation and distribution of a video in the study region to document farmer management practices and adaptations in agro-ecosystems, (iv) widening the participation of farmers in the role of local peoples in natural resource management, and (v) presenting at conferences, workshops, guest lectures and television programs to a wide audience including scientists, students, farming communities, policy makers and the general public.

We will build educational opportunities that increase student understanding of human-environmental interactions and the importance of both natural and social sciences to sustainability, including (i) providing training to undergraduate and graduate students (including those studying at minority-serving institutions) on field and laboratory research methods, (ii) integration of research material in curriculum of an introductory undergraduate environmental biology course and seminar (iii) maximizing recruitment and retention of underrepresented students in the sciences, (iv) adapting the curriculum developed for the undergraduate seminar for a K-12 audience, and (v) training students in science communication.