**Improved Modeling of Household Food Security Decision Making
And Investments Given Climate Change Uncertainty:
Associate Award AIDOAA-LA-11-00010 under Food Security III, CDG-A-00-02-00021-00**

Introduction
The activities proposed under this associate award will contribute directly to the goals of the Feed the Future (FTF) initiative, which recommends that assessment of climate risk should be incorporated into food security efforts, stating: "Ensuring a sustainable and resilient agricultural development strategy requires countries to understand the potential implications of current and anticipated climate risks and vulnerabilities on the strategic objectives of their food security programs" (FTF 2010, 30-31). Pilot activities will be carried out in Zambia (Year 1) and Kenya (Year 2). These countries include significant areas that fall into two of the FTF Research Strategy's priority maize-based production systems.

Michigan State University has two groups of researchers whose work relates to the above topics. First, a group of geographers and agro-climatologists has an East Africa regional modeling framework, including coupled climate, crop, land use and surface water simulation models that allow analyses of current and future effects of climate and management factors on crop production. Second, the MSU Food Security Group carries out the Food Security III Cooperative Agreement and related projects. FSG projects have included support for multiple years of nationally representative farm household surveys, collected by the Central Statistical Office in Zambia and by the Tegemeo Institute and the Central Bureau of Statistics in Kenya. These surveys include panels of the same households covering three years in Zambia (2001, 2004, 2008) and five years in Kenya (1997, 2000, 2004, 2007, 2010).

Purpose of Award
The purpose of the activities supported under this Award is to link the multiple-year household survey data and the climate, crop, land use, and water availability models, in order to improve understanding about how rural households are adapting to climate change (in terms of agricultural technology use and production practices, and perhaps other income-earning strategies), and about the impacts of anticipated future climate scenarios on farm household production, income, and food security. This information will help refine the climate change models and estimates of future household technology adoption and investment decisions, with implications for country program and policy priorities.

Proposed Activities
The following activities will be carried out over a 3-year period beginning in October 2011. The award is funded by USAID/BFS/ART. Total award: $700,000. MSU Co-PIs are Eric Crawford and Jennifer Olson.
1. Historical analysis of rainfall patterns over space and time using weather station data and data from the African Rainfall Estimation Algorithm (RFE).
2. Analysis of impact of past climate variability and trend changes on maize yields, using climate-crop models, and on indicators of household well-being such as food security and income, using the multiple-year household data.
3. Projection of future climate scenarios and their impacts on maize yield and output.
4. Construction of farm household models, and incorporation into those models of projected future climate change and maize yield scenarios in order to identify impacts on future household production, farm and off-farm incomes, and food security.
5. Use of farmer and key informant focus groups to guide the design and interpretation of (1) and (2), and feedback groups to discuss the outcomes of (3) and (4).
6. Outreach to key stakeholders in the pilot countries and in the U.S.

Anticipated Results
Output of these analyses will serve as:
1. A base reference for development of national- and local-level strategies for adaptation to increasing climate variability and climate change;
2. Information to plan for future variability in agricultural production and commodity trade due to climate and crop management factors such as fertilizer application rates.
3. Prototype model linking household food security to crop-climate and climate data and simulations to identify household decision making in the face of climate change and variability.