Interdisciplinary Science Team Supports Sustainable Food System Development in the Federated States of Micronesia

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Rutgers and The Federated States of Micronesia (FSM)

The Federated States of Micronesia (FSM) is an island nation in the north Pacific that is extremely vulnerable to climate change. FSM has a population of 110K people speaking 17 distinct languages across 607 islands within one million square miles of ocean and is home to some of the most biodiverse terrestrial and marine ecosystems in the world. FSM is threatened by sea level rise, altered rainfall, rising temperatures, and increased storm frequency/intensity all of which directly impacts local food production. FSM's indigenous population has become dependent on imported, unhealthy processed foods and non-communicable, diet related diseases are their greatest health threat. Thus, developing a sustainable local food system in this rapidly changing climate has become a national priority.

Building an Interdisciplinary Science Team to Support Sustainable Food System Development and Strengthen Local Food Security in the FSM

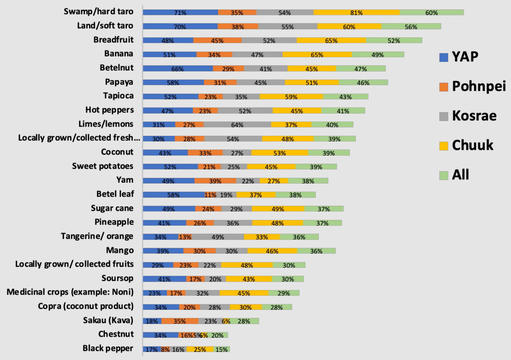
The inherent complexity of food systems in a changing climate requires a multidisciplinary approach. Rutgers researchers from a variety of disciplines have joined together to develop a holistic approach to sustainable, climate-resilient food system development that bridges Agriculture and Plant Sciences, Marine and Aquaculture Sciences, Agribusiness and Economics, Nutrition, Engineering, Ethnobotany, and Social Sciences. On behalf of the FSM Departments of Resources & Development and Environment, Climate Change and Emergency Management and in partnership with the Micronesia Conservation Trust, our Rutgers team conducted a baseline survey for the Green Climate Fund (GCF) "Climate-resilient food security for farming households across the Federated States of Micronesia" to gather baseline data on FSM subsistence farming households' food production, market challenges and goals for agriculture, livestock, poultry, fish and marine harvesting within a changing climate. 600 farming families, as well as commercial growers and focus groups, were surveyed following IRB protocols approved by both the College of Micronesia (COM) and Rutgers. The purpose of this GCF food security project is to assess best steps to supporting subsistence farming families with sustained and increased climate smart food production capabilities. The GCF Baseline survey results provide important insights into FSM's food system strengths and vulnerabilities as well as the food system development goals and needs of FSM farming communities. The results of this baseline assessment has informed the environmental and food security documents and policies seen below including FSM's Third National Communication to the United Nations Framework Convention on Climate Change (UNFCCC), the Pohnpei State Food Security & Food Production Master Plan and the FSM Agriculture & Food Production Vulnerability Assessment.

Interdisciplinary partnerships are essential to successful international development strategies. The Rutgers Food System Science team has members from **Plant Biology, Agricultural, Food and Resource Economics (DAFRE), Marine and Coastal Sciences, and Environmental Science, Human Ecology and Public Health** working together to assist the FSM with their most pressing food system challenges including the impacts of climate change. Multifaceted and complex problems require interdisciplinary multi-pronged approaches that allow for for comprehensive understanding of these interconnected issues, resulting in effective and innovative solutions. The Rutgers team working in the FSM leads with **co-creation** through the involvement of local communities in the development and design of food production solutions that are culturally relevant, practical, and likely to succeed, while promoting equity and social justice. This collaborative process allows for continuous feedback and adaptations to the needs and wants of the people involved.

Local Food Crops Most Impacted by Climate Change

The majority of FSM farmers shared that they were experiencing crop losses of 60% for swamp taro, 56% for land taro and 52% for breadfruit, and 49% reporting banana crop loss.

Are you experiencing crop loss? If so, which crop?



Climate Change Impacting Household Economic Livelihood

Key findings relative to baseline indicators reveal that, over the past year, households incurred average losses of $444 from crop plants, $213 from livestock, and $156 from aquatic foods due to climate change or extreme weather impacts on economic assets.

Perceived Economic Loss Due to Climate Change/Extreme Weather	Yap	Pohnpei	Chuuk	Kosrae	FSM
No Households	148	155	151	150	604
Economic Loss Plants $	210	586	307	645	$444
Economic Loss Livestock $	56	42	347	399	$213
Economic Loss Aquatic Foods $	88	40	257	235	$156

Climate Change Impacting Coastal Communities

Baseline surveys indicate that 60% of farmers in Chuuk have experienced King Tides, significantly more than in any other FSM state. Additionally, a substantial percentage of farmers in both Yap and Chuuk have faced saltwater intrusion affecting their crops, with over 50% of farmers in Chuuk impacted.

Have you or your family experiences tidal surge (king tides) in the past year?							
Yap		Chuuk		Pohnpei		Kosrae	
NO	87%	NO.	40%	NO	92%	NO	81%
YES	13%	YES.	60%	YES	8%	YES	19%

Have you or your family experienced saltwater intrusion impacting your crops in the past year?							
Yap		Chuuk		Pohnpei		Kosrae	
NO	60%	NO.	43%	NO	95%	NO	71%
YES	40%	YES.	57%	YES	5%	YES	29%

Rainfall-Driven Coastal Soil Erosion

As part of the GCFSAP020 survey, the potential annual estimated risk of coastal soil erosion due to water runoff in the FSM was assessed using the Revised Universal Soil Loss Equation (RUSLE). The RUSLE equation is based on five contributing factors: Rainfall Erosivity, Soil Erodibility, Slope Length and Steepness, Cover Management, and Conservation Practice. Average annual rainfall-driven soil loss can be calculated as the product of these parameters.

Mean estimated soil erosion risk for slopes <50% grade across each island is high, with Pohnpei being the lowest at 33.4 tons hectare^{-1} year^{-1} and the highest being Chuuk at 373.3 tons hectare^{-1} year^{-1}. These values are variable across each island, with the greatest erosion being along steep slopes, rivers, and regions with limited tree cover (Figure 1).

Figure 1: Spatial distribution of rainfall-driven erosion risk across the main islands of the FSM

Results from this baseline data has been used to guide and prepare the four research and public policy documents shown below. This GCF baseline research thus serves as a reference and guide for local FSM decision makers and assists local governments as they develop sustainable food system policies and seek funding for culturally relevant and sustainable food systems strategies.