Indigenous agriculture has potential to contribute to food needs under climate change

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The State of Hawaii, like many municipalities across the globe, aims to increase its food self-sufficiency, with a target of 30% of its food produced locally by 2020. Increasing temperatures and changes in precipitation are already occurring locally and globally, and plans to meet food self-sufficiency goals must consider how climate change will affect agricultural viability.

Researchers from Kamehameha Schools, University of Hawaii at Manoa (UH Manoa) and the United States Geological Survey (USGS) have published a study in the journal *Nature Sustainability* highlighting the large role indigenous agriculture can play in producing food, while supporting biodiversity and indigenous well-being in Hawaii under intense land use and climate changes.

The researchers of the study focused on the archipelago of Hawaii, where development pressure, rates of food importation and threats to unique native species are among the highest in the world. Furthermore, climate change impacts are expected to increase risks to communities in isolated regions like the Pacific, heightening the necessity of resilient, locally-produced food and community-based solutions.

To determine the past, present and future potential of indigenous Hawaiian agroecosystems and inform their restoration, the researchers developed spatial distribution models of three main Kanaka Maoli agroecosystems under current and future climate change scenarios. The models incorporate environmental and climactic data to determine areas suitable for certain crops and agricultural systems. The team found that Hawaii could have sustained approximately 250,000 acres of traditional agroecosystems, potentially producing more than 1 million metric tons of food annually, levels comparable to food consumption in Hawaii today. Furthermore, the study's carrying capacity estimates lend support to previous hypotheses that pre-contact Kanaka Maoli populations were comparable to Hawaii's population today.

Said Dr. Natalie Kurashima, lead author of the study, "For indigenous communities around the world, the restoration of indigenous food systems goes far beyond food security, providing opportunities for strengthening identity, social ties, knowledge transmission and well-being, inseparable from indigenous food. All of these characteristics, evident in the growing number of aina revitalization efforts going on across Hawaii, can improve social resilience to climate change."

The study also showed that although Hawaii is one of the most urbanized Pacific Islands, urban development has only slightly reduced potential traditional agroecosystems and the majority of suitable areas (71%) remain agriculturally zoned,

and thus could be restored without land use restrictions today. However, like many agricultural lands around the globe, these areas are continually threatened by land conversion and development, emphasizing the current need to protect and utilize these indigenous agricultural lands.

The researchers found that projected effects of three future climate scenarios vary from no change in potential production, to decreases of 19% in the driest and warmest end-of-century scenario, meaning that large indigenous agricultural areas will likely be viable under a range of future climate changes.

"The study provides the first set of maps illustrating indigenous agricultural lands that could be resilient to a wide range of future climate shifts, which could help land owners prioritize target areas for restoration of Native Hawaiian agriculture today," said Dr. Lucas Fortini of USGS and co-author of the study.

"Our study provides a new understanding of the food production contribution of indigenous Hawaiian agriculture now and into the future, and really highlights the relevance of restoring indigenous agricultural systems today. These systems are flexible and adaptive, and include both traditional and modern crops relevant today," said Dr. Tamara Ticktin, professor of botany at UH Manoa and co-author on the study.

More information: Natalie Kurashima et al, The potential of indigenous agricultural food production under climate change in Hawai?i, *Nature Sustainability* (2019). DOI: 10.1038/s41893-019-0226-1

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