Researchers find direct links between deforestation and reduced dietary quality

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Current policies for guaranteeing food security emphasize the importance of farmland, but forests play critical roles as well. Forested areas can help communities that rely on wild foods to diversify their

diets and meet their nutritional needs, according to researchers who found direct links between deforestation and reduced fruit and vegetable consumption in rural Tanzania.

"In recent years, a growing body of literature has shown strong positive connections between forests and food security in low- and middle-income countries," said Charlotte Hall, postdoctoral fellow at the University of Copenhagen, Denmark, and lead author of the paper. "Our study is the first of its kind to find a causal relationship between deforestation and a reduction in people's dietary quality."

The researchers studied the food consumption of 1,256 households in rural Tanzania over a 5-year period. The data, provided by the World Bank, was georeferenced and randomly displaced by up to 3.11 miles for confidentiality purposes, giving the researchers an approximate measurement of the households' proximity to forested areas. The team used satellite imagery and geospatial datasets to measure forest cover over the study period.

The scientists found that as forest cover decreased, so did reported fruit and vegetable consumption. Forest cover shrank by an average of approximately 423 acres over the 5-year period. Fruit and vegetable consumption decreased by 14 grams, or half an ounce, per person per day, representing an 11% reduction in the amount eaten daily. The researchers published their findings in the *Proceedings of the National Academy of Sciences*.

Wild food is central to the diet of rural people in Tanzania, and the country has seen significant environmental change and deforestation in the last two decades, said Bronwen Powell, assistant professor of geography, African studies and anthropology at Penn State and study co-author. Powell has conducted nutritional research in Tanzania for more than a decade, and her doctoral work helped to lay the groundwork for

the current study.

"The results of the study are startling," Powell said. "We have this very clear signal in the data about fruit and vegetable consumption. Also, we have a strong understanding that fruit and vegetable consumption is associated with health outcomes. Low consumption of these foods is one of the leading causes of mortality globally. It's right up there with risk factors like alcohol consumption and unsafe sex. If we can link deforestation to fruit and vegetable consumption, it's very concerning."

The team saw the largest decline in the daily intake of leafy green vegetables, mangoes and other fruit—produce most often foraged from the forest or grown on trees. These foods are high in vitamin A, an essential micronutrient.

"We focused on three key micronutrients in our study—iron, zinc and vitamin A—because these are the most commonly deficient nutrients in low- and middle-income countries," said Hall. "We did not find a link between forest loss and iron or zinc, but we did find a strong link between forest loss and vitamin A."

The researchers found that household vitamin A adequacy decreased over the study period as a result of deforestation. Vitamin A deficiency has severe health outcomes and can lead to blindness, weakened immune function and respiratory tract infections, Powell said.

Powell has spent her career working alongside and adjacent to people who think about how agricultural systems can support diet quality and food security. She noted that previous studies have tried to generate numbers in terms of the impact of crop diversity or an agricultural intervention on diet.

"The magnitude of impact that we see from agriculture on diet is less

than what we see in this study," said Powell. "So, this research really should push people to think beyond the field when trying to help rural communities improve food security in places where wild foods are important."

The majority of policies aimed at improving food security in low- to middle-income countries tend to promote increased agricultural production, particularly the production of staple crops, which often comes at the expense of forests, said Hall. The results of the current study point toward an alternative approach to improving food security in these countries.

"While increased agricultural production will undoubtedly be important for meeting the food needs of a growing population, policy makers should give more consideration to the role of forests," Hall said. "This is particularly important given that micronutrient deficiencies affect far more people than undernourishment, and our study has shown that deforestation directly reduces people's ability to source fruits and vegetables that are rich in important nutrients such as vitamin A. Ultimately, we recommend the preservation of forests, which may offer win-wins in terms of meeting both nutrition and environmental goals."

More information: Charlotte M. Hall et al, Deforestation reduces fruit and vegetable consumption in rural Tanzania, *Proceedings of the National Academy of Sciences* (2022). DOI: 10.1073/pnas.2112063119

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