

Crickets aren't the miracle source of protein

April 16 2015, by Kathy Keatley Garvey



Credit: Kathy Keatley Garvey/UC Davis

Crickets are not all that they're cracked up to be as an alternative, global source of protein in the human diet to supplement or replace livestock consumption, according to newly published research completed at the University of California, Davis.

Crickets, known to pack a protein punch, are often touted as "the sustainable food of the future," but the issue is far more complex than

that, say University of California Cooperative Extension agronomist Mark Lundy and horticultural entomologist Michael Parrella, professor and chair of the UC Davis Department of Entomology, in research published today (April 15) in the *Public Library of Science (PLOS ONE)*.

"While there is potential for insect cultivation to augment the global supply of dietary protein, some of the sustainability claims on this topic have been overstated," said Lundy, who headed the research at UC Davis while seeking his doctorate in agronomy. "Our study demonstrates that the sustainability gains associated with cultivating [crickets](#) as an alternative source of protein will depend, in large part, on what the crickets are fed and which systems of [livestock production](#) they are compared to."

More innovation needed

"Insect cultivation is more likely to contribute to human nutrition at a scale of economic and ecological significance if it does not rely on a diet that competes with conventional livestock, but more innovation is needed for this to become a reality," Lundy said. "Moving forward, the imperative will be to design cost-effective processes that enable large populations of insects to capture protein from underutilized organic waste and side streams."

Said Parrella: "Everyone assumes that crickets—and other insects—are the food of the future given their high feed conversion relative to livestock. However, there is very little data to support this and this article shows the story is far more complex."



Mark Lundy not only has studied crickets as a food source — he's sampled them as well. Credit: University of California

For the study, the researchers modified a UC Davis greenhouse into replicated cells. They measured the biomass output and feed conversion ratios of populations of crickets (*Acheta domestics*) reared on food that ranged from grain-based to highly cellulosic diets. They found that the biomass accumulation was "strongly influenced by the quality of the diet."

"The measurements were made at a much greater population scale and density than any previously reported in the scientific literature," they wrote. "The biomass accumulation was strongly influenced by the quality of the diet, with the nitrogen concentration, the ratio of N to acid detergent fiber content, and the crude fat explaining most of the variability between feed treatments. In addition, for populations of crickets that were able to survive to a harvestable size, the feed conversion ratios (FCR) measured were higher (less efficient) than those reported from studies conducted at smaller scales and lower population densities. Compared to the industrial-scale production of broiler

chickens, crickets fed a poultry feed diet showed little improvement in protein conversion efficiency (PCE), a key metric in determining the ecological footprint of grain-based livestock protein."

"Crickets fed solid filtrate from food waste processed at an industrial scale via enzymatic digestion were able to reach a harvestable size and achieve an FCR and PCE similar to that of broiler chickens," they wrote. "However, cricket populations fed minimally-processed, municipal-scale food waste and diets composed largely of straw experienced more than a 99 percent mortality before reaching a harvestable size."

The researchers concluded that the potential for "*Acheta domesticus* to sustainably supplement the global protein supply, beyond what is currently produced via grain-fed chickens, will depend on capturing regionally scalable organic side-streams of relatively high-quality that are not currently being used for livestock production."

'Gateway bug'

Worldwide, statistics show that crickets are the most widely cultivated insects for the human diet, and are considered the "gateway bug" to entomophagy. They are touted as highly nutritious, and much better for the planet—environmentally and financially—than livestock due to their comparatively efficient feed conversion.

Lundy, who received his doctorate in agronomy in 2013 and his master's degree in international agricultural development in 2010 from UC Davis, has engaged in entomophagy. Crickets? Yes. "I ate some of my experimental subjects, after weighing them for the research," he said. He dusted them with cornmeal and Cajun seasoning and fried them in olive oil. He has also snacked on protein bars made with cricket flour.

"I'm all for exploring alternatives, and I am impressed by the amount of

innovation that has sprung up around insect cultivation and cuisine in the last few years," Lundy said. "However, I also think we need to be clear-eyed about what the sustainability gains are and aren't, and focus our innovative efforts and limited resources to where they will have the most lasting impact."

Crickets are readily available in pet stores as food for turtles, frogs and other pets. Part of many human diets, they are considered delicacies or snacks in many countries. Cricket flour is now commonly found in protein bars, baked goods and [protein](#) powders.

More information: "Crickets Are Not a Free Lunch: Protein Capture from Scalable Organic Side-Streams via High-Density Populations of *Acheta domesticus*." *PLoS ONE* 10(4): e0118785. [DOI: 10.1371/journal.pone.0118785](#)

Provided by UC Davis

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