

FIELD TRIP: A Hawai'ian Breadfruit Rev'ULUtion

Ologies Podcast

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Oh hey, it's that friend who looks so good in hats, they never don't wear a hat, Alie Ward. Let's take a field trip. Coincidentally, not coincidentally at all, this is Indigenous History Month here in the United States of Colonized America. So, we're heading to the Pacific to chat about foods of Native populations and this movement to study, and cultivate, and reintroduce them.

Last summer, I had this rare opportunity while doing a symposium for USC's Storytellers Program; I was teaching climate scientists about sci-comm and I got to meet some really lovely and super brilliant folks. One of them told me that he was working in breadfruit and knowing Jack about it, of course, I had to corner him on a boat dock on Catalina Island to start asking him one million questions. One of these you may have like me is: What is a breadfruit? Is it a baked good? Is it a sweet, juicy thing on a vine? Is it a carb? Is it meat? What's happening here? And we'll dig in.

But first, a quick primer is that the islands of Hawai'i are right in the middle of the Pacific Ocean. It's, like, 2,000 miles in either direction from Polynesia or North America. So, about a thousand years ago, folks from Polynesia cruised over on these big, double-hulled canoes, guided by stars. They got to Hawai'i, they were like, "These volcano-made islands are great. Let's live here. Let's bring our pigs, chickens, dogs," and foods like coconut and sugarcane and bananas and taro root and breadfruit." So, many centuries later, European explorers, we'll call them, landed, then thought the islands were sweet and they were pretty, they liked the food. So, the roasted breadfruit smelled like bread to these colonizers who called it breadfruit, although Native Hawai'ians have plenty of other names for it, which we'll hear about in a bit. But a botanist on Captain Cook's ship took some notes in praise of this food source. He wrote:

Their chiefest sustenance, Bread fruit, is procured with no more trouble than that of climbing a tree and pulling it down. If a man should, in the course of his lifetime, plant 10 such trees, which might take the labor of an hour, he would as completely fulfill his duty to his own as well as future generations that we Europeans can do by toiling in the cold of winter to sew and in the heat of summer to reap the annual produce of our soil.

They were like, "Wow. What are we doing working so hard for wheat when breadfruit is good and easy to grow and harvest?"

Anyway, back to this dock outside of LA, California, at the USC Wrigley Institute for Environment and Sustainability's Storymaker Symposium of all these climate scientists. So, this wonderful breadfruit expert studied Environmental Engineering at Yale and did doctoral research at Stanford University in Biogeochemistry and Social Ecology. He's now a professor of Indigenous Crops and Cropping Systems at the University of Hawai'i at Mānoa. And he said if I were ever in Hawai'i, he'd be happy to have me visit for a tour of his breadfruit farm. So, months later, already headed to Hawai'i for some interviews and a visit to family, I stopped by, I met some breadfruit and some dogs and some other researchers in this world, and now, we have this scrumptious field trip on which to take you.

So, all aboard. Let's go breadfruit growing with ethnobotanist, Indigenous ecobiologist Dr. Noa Kekuewa Lincoln, and research assistant and soil scientist who's working on her PhD at the University of Hawai'i at Mānoa, Dolly Autufuga, for this Field Trip: A Hawai'ian Breadfruit Rev'ULUtion.

Aside: So, to set the scene, I've been on Catalina Island outside of LA for several days with about a half a dozen climate scientists and science communicators like Liz Neeley and Ed Yong. For days, we've all been sharing meals and telling campfire tales over glasses of wine, listening to stories of each other's lives, and just becoming pals. So, it's near the end of the trip and now Noa and I are walking down a hill from the USC Wrigley Institute to the rocky shoreline where a boat is docked, bobbing as it waits to take these climate scientists to a final dinner together.

Alie: [*sings*] Noa! You have a minute while we walk? Yeah, we'll walk and talk.

Noa: Noa Lincoln, he/him.

Alie: And what's the genus and species of the breadfruit that you study the most?

Noa: Well, they're all the same species.

Alie: They are?!

Noa: *Artocarpus altilis*.

Alie: Okay. Are you an artocarpologist? [*Noa laughs*] Have you looked up to see if that's an ology? You knew I was going to be here. Did you look up earlier?

Noa: I did not. I tend to lump it all under our broader work of ethnobotany or ethnobiology, I guess if we want an "ology" in there.

Alie: I was going to say, how dare you with the "etany". We might as well come out with an "ics"! I can't do anything with that or an "ism."

Aside: In a quick primer, breadfruit is in the fig family, and it's closely related to jackfruit. And there are three related species in the genus *Artocarpus*, which means, in Greek, 'breadfruit,' literally.

So, most of the cultivated breadfruits descend from the species known as 'breadnut,' which is native to the Papua New Guinea area. And in general, breadfruit is bigger than you might picture it, like, some weigh as much as a watermelon. They look like huge, green dragon eggs, though, their varieties can be as tiny as an apple, some of them. Also, like blackberries, breadfruit are a compound fruit. So, each big ol' breadfruit is actually up to 2,000 flowers fused into one mega fruit, which is why it looks spiky or scaled like lizard or, I suppose, dragon skin.

Alie: Okay, breadfruit. What was the first time you ever ate it? Because you were born on Hawai'i.

Noa: Yes. I mean, we had it as kids, you know, but pretty sparsely. I've probably been working on breadfruit for about 10 years now and I would say one of the things that was an epiphany to me was how challenging it is to change our personal habits, particularly around the way we eat. And so, you know, especially with our staple foods, there are comfort foods, right? We grew up on rice, and transitioning to, you know, particularly our Indigenous starches, of which breadfruit is one, it was a very challenging and deliberate switch that took a *lot* of years.

Aside: And staple foods are the ones that we tend to eat every day, and different cultures tend to lean toward their own staple foods. Think, like, wheat and rice, and corn, and millet, and yam, potatoes, sweet potatoes. According to the book, *Thinking Like an Island: Navigating a Sustainable Future in Hawai'i*, before the Western colonization of Hawai'i by whalers and missionaries, the hundreds of thousands of people on the Hawaiian islands were self-sufficient for food. But now, 85% of food is imported. So, breadfruit has held this important place in terms of staple foods, and Noa and his colleagues are bringing it back.

Alie: And so, the first time you tried it, do you remember? Was it mixed in with something else you had? Was it fresh off a tree? Can you eat it right off a tree, or must it be cooked?

Noa: You can. You know, breadfruit is a fruit; it ripens, it goes through stages. So, unlike most of our staple foods, like, you know, rice or potatoes, but it's diverse. In its youngest stage, maybe about the size of a baseball, it's a lot like a vegetable; you can pickle it. People make things that taste like artichoke hearts, basically.

Alie: Oh, yum!

Noa: And then, you know, it matures, and then basically at that point, it's a big potato on a tree. [*Alie laughs*] So, that's when most people eat it. That's the stage I first had it. And it doesn't stick in your mind, per se. Like, nobody grabs a potato and tears into it and goes, "Yum!" You know, no. [*You sure about that?*] You slather up sour cream and bacon and butter, and then it's, you know, takes on the flavor of what you're doing. But, you know, it's a staple, it's a starch, and in some cases, it's a little bland, but if you know what to do with it, it can be delicious.

Aside: We kept ambling toward the dock, where other scientists from the symposium had started to gather to board the boat to dinner.

Alie: Does it take a while for the tree to mature in order to bear fruit, or does it make fruit even when it's young?

Noa: This is a lot of the work we're doing, kind of these basic agronomy questions. So, for instance, we have a trial in Hawai'i spread out across the state in different habitats; a sea spray habitat, a high wind habitat, a high elevation-cold temperature habitat. And we've seen fruit as young as 18 months, and we've seen trees take up to seven years to start producing. So, it depends on your site, your environment, your variety you're growing, all those things.

Aside: For more on this, you can see Noa's co-authored 2020 paper, "Cultivation potential projections of breadfruit under climate change scenarios using an empirically validated suitability model calibrated in Hawai'i," which warns that if we want to figure out how to grow food that can withstand future climate change, we've got to figure it out *now* to get ahead of it. And in perhaps the only good news about climate change, this study concluded that there is substantial and increasing potential for future breadfruit production in Hawai'i as the climate heats up. The trees like the warmth.

Alie: And grows best in the tropics or closer to the equator?

Noa: It is definitely a tropical tree. So, even in Hawai'i, you know, we're technically subtropics, everyone thinks of us as tropical, but compared to places like Tahiti and Bali, like, we're actually kind of cold.

Alie: Oh wow!

Noa: So, when you move up the mountain in Hawai'i, breadfruit will pretty much only grow below about a thousand feet. And above that, it starts getting too cold.

Alie: Oh, I wouldn't even have thought of that. Because the volcanoes are so tall?

Noa: They are, yeah. Mauna Kea is technically the tallest mountain on Earth if you measure it from the sea floor, 14,000 feet above sea level. So yeah, you'll sit in the beach, 85 degrees, sunny, drinking a Mai Tai and there's snow on top of the mountain right up there.

Alie: Oh god, that's crazy!

Aside: And our very first episode of *Ologies* was Volcanology in case you need a primer on that. But with beaches all the way up to these huge volcanic mountains, essentially, Hawai'i has a broad

range of soil types and elevations and thus ecosystems. There's a classification called Holdridge life zones and out of the 38 types of zone on the planet, Hawai'i has 27 of them. And though breadfruit isn't native to the islands themselves — again, it originated in New Guinea and it was brought to Hawai'i by early Polynesian settlers nearly a thousand years ago — breadfruit grows well in many parts of the islands. There's a seedless variety, those are the ones that are commonly eaten, they have to be propagated by grafting a lot like apples, which we have a whole Pomology episode about that.

Oh, and remember the Captain Cook expedition that I talked about in the intro? Well, once the European colonizers found out how great breadfruit was, they wanted to take it to the tropics to use it as a staple food for enslaved populations. And one absolutely bonkers story, I'll sum it up quick. It involves that botanist that I mentioned in the intro, traveling on a ship for a breadfruit tree gathering mission, and in order to fit this breadfruit tree nursery in the ship, he had to cramp the ship's crew in super close quarters, which they hated. A bunch of the crew got blackout drunk, I guess, spreading a bunch of pretty sexy diseases between them. The angry captain would flog his underlings, there was a coconut heist from the captain's personal stash, and then what has been called “the most notorious mutiny in naval history,” the mutiny on the *Bounty*, which resulted in a lot of destroyed breadfruit trees, and then the ousted captain's new ship run aground on the Great Barrier Reef. Some of the mutineers also started a new colony on an island.

So, breadfruit! In a moment, we're going to talk about a new type of revolution, this time in the hands of native Hawaiians and ethnobotany enthusiasts like Noa.

Noa: My academic training has been in ecology and soil science. But you know, as a child, I was very strongly engaged in our traditional plants, our crops. I was taught how to make herbal medicines, use our traditional foods. Essentially, that is what people go off to school for to learn to become an ethnobotanist. And so, you know, I had very informal training in ethnobotany and have kind of come full circle in my life back around and really re-engaged with a lot of these crops that I was exposed to as a kid.

Alie: Yeah. Now, were your parents also born in Hawai'i or did they move there at a certain point? How did your family end up there?

Noa: Well, my father's side is ancestrally Hawaiian. So, you know, we can trace our lineage back 16 generations, probably further, but that's where, you know, it kind of fizzles in terms of tracking things down. That whole side of my family is in Hawai'i, we're based in Hawai'i, and yeah, it's home. *[laughs]*

Alie: And when you first started trying to promote more agriculture around breadfruit, it wasn't as easy a sell as you thought it was going to be. Did you think people were going to say, “Yes, absolutely. *[Noa laughs]* It's time that breadfruit got its due in the sun.” What was difficult about convincing communities that this was something worth investing in?

Noa: I would say I absolutely did not expect people to jump on it. I mean, we were passionate about breadfruit because we knew about it and that's one of the big barriers. People don't know about it.

Aside: Did you know about it? Now you know about it.

Noa: And to get people excited about it, you know, to get them to engage in it, to use it, to bring it back into the food system, we knew it was going to be a big educational push. And that's kind of what we've been hanging our coat on, right? If we can just teach people, expose people, all these wonderful things about the food, like, of course, they're going to have it. But you know, if you just put it in the shelf, people walk into a store, they got no idea what it is, you know, that's scary. “I don't want to grab a new food. I don't know how to cook or use or anything.”

Alie: Right. Is it going to sit in the crisper until it's rotting and then you're like, "I spent seven bucks on that. Why'd I do that?" [Noa laughs]

Aside: Is seven bucks an exaggeration? We did some fact-checking and the actual going rate for whole breadfruit... It depends on where you live. But in some places, it's less than two bucks a pound, with the average breadfruit weighing two and a half pounds, just over a kilo. So, what? That's like five, seven bucks.

But a 2019 study, "Interactions between People and Breadfruit in Hawai'i: Consumption, Preparation, and Sourcing Patterns," in the journal *Sustainability*, found that most Hawaiians ate breadfruit three times a year or less and over 70% of those people got it from a friend's tree. Although, having your own breadfruit tree meant eating it about four times more than the people without the trees. So, imagine having a tree with three-pound potatoes just growin' in your yard.

Alie: And it's called "ule," [phonetic: oo-lay] you said, in Hawai'ian?

Noa: In Hawaiian, it's 'ulu. [phonetic: oo-loo]

Alie: 'Ulu. And so, when did the idea for a rev'ULUtion, with that in the middle? [Noa chuckles]

Aside: Rev'ULUtion. Do you get it? And their logo has a fist, uprising, clutching a branch bearing a big old breadfruit. So, Noa is very passionate about getting the word out and getting breadfruit back onto dinner tables.

Noa: So, we got into the broader food system of 'ulu out of establishing a breadfruit farm. So, we've had a lot of time on the farm with groups of people and friends, you know, doing hard physical labor and oftentimes raining. But then afterwards, you're often sitting around and just kind of kicking ideas and that's when a lot of, I think, kind of the catchphrases have come out or, you know, how do we share this excitement, right? We're so stoked on this food and how do we get it out? So, there's a lot of things that came out of those early sessions. We called it a "solutionary food," which is the revolutionary solution that our food systems need.

You know, I do science because I want to see the effect of it in our communities. I want to see it applied and changed to make the world a better place. And I think unless you really get it outside of our little circles, it's never going to do that.

Aside: And Noa had just become a tenured professor, but he was at the Wrigley Storymakers' Program to hone skills at communicating his science to a broader public, especially to the communities affected by food scarcity and whose lives will be impacted positively through more sustainable farming.

Alie: Where can people find out more about what you do or about breadfruit? If people are like "A bread what?!" where do you point them?

Noa: Well, if you want to learn about breadfruit, I would definitely suggest going to EatBreadfruit.com. That is the Hawai'i 'Ulu Producers Cooperative; we work collectively with them to get a lot of the information and stories out there. So, you can learn about it, you can learn how to cook it, you can buy it, you can engage with it, you can read stories about the farmers, you can see cooking demonstration videos, you know. So, that's again, part of this educational campaign. So yeah, you want to learn about breadfruit, EatBreadfruit.com.

Aside: Again, that's EatBreadfruit.com.

Alie: Favorite recipe?

Noa: Oh boy. So, for early engagement, I really like twice-cooked patties. So, you know, you steam them, mash it up with some diced onions, Lea and Perrin, salt, pepper, garlic, you know, a little bit of oregano maybe, slam those out into patties, and then pan fry 'em.

Alie: Nice.

Noa: That's a good one.

Alie: Sounds like a latke.

Noa: Yes, it's a little bit like a latke, but less oily. *[laughs]*

Alie: Oh! Good to know.

Noa: To me, our favorite product we actually have out is a breadfruit chocolate mousse. *[Alie gasps]* So, I told you breadfruit goes through stages. After that mature potato stage, it actually ripens, it sweetens, it softens. You take that ripe, sweet, soft breadfruit and we blend it with local honey, coconut milk, and local cacao, *[Alie groans]* and then we freeze those so it's a mousse. But it's vegan, 100% local, and 95% breadfruit, but you would never know that when you stick it in your mouth, it's delicious.

Aside: I later finally made it to the Big Island in Hawai'i and I was able to visit the 'Ulu Co-op and take home some breadfruit flour and yes, I got to try this chocolate breadfruit mousse and it was great. It was like a frozen yogurt custard texture and had this nutty flavor, I loved it.

Alie: And a complete protein too?

Noa: It is, yeah. Breadfruit has a strong human health component to it. So yeah, complete protein, all seven amino acids, fairly high in vitamins and minerals. There's a lot of emerging research, it's a little bit more close to home, but particularly for our native Hawai'ian Pacific Islanders, they're very high at risk for type 2 diabetes, hypertension, and there's a lot of research emerging showing that returning to traditional staples and starches drastically reduce those kind of diet-related diseases. And so, with breadfruit, that's related to a relatively low glycemic index, meaning that when you eat it, you're full for a while, you don't burn right through it, want to eat again in an hour or so.

Aside: And for more on how your body processes food, you can see the wonderful two-part Diabetology episodes on blood sugar with Dr. Mike Natter, who is a self-described diabetic diabetologist. And in it, we go over the glycemic index, which essentially rates foods based on their blood sugar and insulin impact; the higher the number on the glycemic index, the more potential for some adverse blood sugar effects. Plain white bread is up there at 90 out of 100; white rice is 70; boiled potatoes are high at 70. But breadfruit is low to medium at 47 up to 70. How it's prepared and what it's mixed with also makes a huge difference.

Now, a 2015 study in the journal *Trends in Food Science and Technology* titled "Breadfruit: A traditional crop with potential to prevent hunger and mitigate diabetes in Oceania," explained that around 1950, studies found that Pacific Islanders were "Remarkably physically fit with no evidence of malnutrition or obesity and no incidence of diabetes." But just 30 years later in the 1980s, incidence of diabetes and obesity had skyrocketed and now, Pacific Island nations have some of the highest rates of diabetes worldwide. Obesity, I know, is a loaded word, but it's the medical term that researchers and doctors use when describing certain body compositions that may put people at greater risk for metabolic and cardiovascular disease.

Now, other recent papers have found that a diabetes prevalence of 40% in adults is common among Pacific countries as diets stray away from traditional crops to these imported and

Westernized foods. And even back in 2009, there was a paper titled “Against the Tide of Change: Diet and Health in the Pacific Islands,” it was in the *Journal of the American Dietetic Association*. And it warned that for many of the small dispersed countries of the Pacific, there is a grave concern about international trading in food, not only because of the adverse effects on health (like diabetes) but also in terms of food security, because there's an increasing level of dependence on these food imports. That's another issue because the staple foods that are Westernized that are being imported tend not to grow well near the equator. So, breadfruit is kind of on the way to swoop in and solve a lot of pressing problems for Pacific Islanders.

Alie: Wow! It must be so easy to be passionate about this because it's outside, it's food, it's tasty, [Noa laughs] it's tied to your heritage and culture, it, like, maybe can save massive amounts of people from hunger. I mean, must be hard to put your laptop away at night and be like, “Okay, it's time for me to just kick back.”

Noa: Yeah. And you left out working with the farmers, which is one of the best parts, because every time you go visit a farmer, talk to them, share with them, you leave with, like, big baskets of fresh mangoes [Alie laughs] and lychee and, yeah, all sorts of goodies.

Alie: Thank you so much for doing this, this was great! Amazing.

Noa: Absolutely. Thank you.

Aside: So, Noa said, if I were ever in Hawai'i, come on down to the farm. And as it happened, months later, I was headed there for a few interviews and field trips and to see some family. So, we got to tour a breadfruit farm, and taste it, and get lost in a jungle, and even harvest some. Now, all of that will be after the break.

But first, let's donate to a cause and this week, it's going to the Hawai'i-based Chef Hui Fund, which connects the culinary world with their community through a strong network of local chefs, produce providers, and educators to deepen the connection to farmers and ranchers and schools and community organizations in an effort to build a more robust food system. So, a link to them is up at EatBreadfruit.com and we'll link in the show notes. So, thank you to sponsors of the show for making that possible.

[Ad Break]

Okay, hop in, let's find this farm, which is one of many research sites that Noa and his team of scientists are monitoring and cultivating to learn where and how to grow and distribute more 'ulu as a staple crop for the islands.

Spk 1: And it's absolutely beautiful, all that.

Jarrett: Alie, I'm guessing you don't have very good service to make a phone call?

Alie: I don't. I can try and see, I've got one bar. [speaks on phone] Hey, Dolly? ... Hey, it's Alie!

Aside: Yeah, we were lost.

Alie: [still on phone] Yeah, sorry, we're in kind of a spotty jungle. We've been through over two little bridges and we're now crossing another one-lane bridge... Okay, so we're headed in the right direction? ... Awesome, thank you so much. See you in a sec. Bye! [to companions] We're really close. Is that her truck? Yeah, there we go. Yeah, okay, cool. She waved. Hi, Dolly! Oh look, this looks like an orchard on our left.

Jarrett: Oh, she's opening the gate.

Alie: Hi, Dolly!

Dolly: Hello, hi!

Alie: So, first off, can you tell me your first and last name?

Dolly: Dolly Autufuga.

Alie: So, we're looking at some very huge trees with giant leaves and a couple of roosters, which is amazing. How many breadfruit trees do you have here?

Dolly: We have 30 trees.

Alie: 30 trees!

Dolly: And there's four varieties plus their ancestry, so five in total.

Alie: If someone comes in here and is like, "I don't even know what a breadfruit is," what do you show 'em?

Dolly: The fruit first. *[laughs]*

Alie: Okay, cool.

Dolly: So, these ones are ready, they're matured.

Alie: And so, do they get smoother when they're mature like that?

Dolly: Yes, when they're smaller, they're a lot spikier. These are different varieties.

Alie: Whaaaaat?!

Dolly: This is the Hawai'ian variety, and this is the ancestry one, this is the breadnut. So, this one is, like, similar to a jackfruit, a durian, and this one is the breadfruit, which becomes smoother as it matures.

Aside: These are the size of an oblong cantaloupe or a large baby's head.

Alie: And when you say ancestry, does that mean it's an older cultivar?

Dolly: Yes, the old, the ancestry, first kind. *[giggles]*

Alie: And then is there an advantage to having different cultivars? Are these easier to grow or harvest, or do they take less time to mature?

Dolly: Well, these ones are more woody in terms of their growth. They are bigger in size compared to other varieties, they're a lot smaller. So, these can feed the whole family. And they're different in flesh, too. The smaller one, which is our Ma'afala, is the yellow flesh so you can do chips and stuff like that. With this one, you can put them in coconut milk or, you know, roast it.

Alie: And then what about the ancestry one?

Dolly: So, this one, it has a lot of seeds in it. A lot of people say you can roast the seed and eat it but because of that, we're growing these for propagation reasons.

Alie: Oh! So, you will take the seeds and then you'll use those to make more trees?

Dolly: Mm-hm.

Alie: How old are these trees? These are seven years old, seven, eight years old, they were planted in 2017. So, this is one of seven breadfruit sites we have around the island.

Aside: Dolly told me that their research involves seven different growing sites in various ecosystems, from a sea spray environment to mountains on several different islands, including Maui and this one we're at, on the Big Island.

Alie: What environment is this? Is this a sea spray? Is this a jungle?

Dolly: It has more rain. It gets more rain compared to other sites and good soil.

Aside: I visited this farm with my wonderful in-laws and your PodMom, Jarrett, who asked about some patches of dried, sappy stuff.

Jarrett: What's the significance of this kind of, like, almost like syrup or something that dried on the outside?

Dolly: Oh, so they call that a latex. It's not only on the fruit but throughout the whole tree. But that's one indicator of maturity.

Aside: And by latex, they don't mean the latex you're probably thinking about. *Latex* just means 'liquid' in Latin, and it is just a milky liquid from plants. Latex can be composed of a whole botanic soup of proteins, and alkaloids, and starches, and sugars, and oils, and tannins, and resins which gum up when they're exposed to air. And they act kind of like a free band-aid for the tree. For more on this, you can see the wonderful Dendrology two-parter with J Casey Clapp. And breadfruit latex specifically, should you lap it off a tree? Let's not. Traditionally, it's been used for boat cocking and bird trapping and healing skin infections, nerve pain. And I guess you could ingest it to help with diarrhea if you have that issue.

Now, it was April when we were crunching around the leaves, which serve as great mulch for the tree, as Dolly told me. But when is it breadfruit season? I was clueless. But Dolly said that harvest season is from June or July all the way to December. And in the past, they have harvested a thousand pounds of breadfruit in one day from this one small orchard. But this little farm we're recording at is a champion producer with an even longer harvest window.

Dolly: It goes on to January, February, just because I think it gets perfect rain, good soil. It's just a good site.

Alie: Do you know, like, what's the biggest breadfruit you guys have harvested?

Dolly: Oh, definitely the 'ulu Hawai'i. It's about 4 KG, it's big. It's bigger than my head. Huge, huge fruits we get off from those.

Aside: That's like eight pounds, like the size of a bowling ball.

Dolly: The leaves are more broader and then the fruits are very different. They are more yellow compared to other varieties. So, this is from the Rotuman, Fijian site, yellow flesh fruit, really good for making 'ulu chips.

Alie: And then, kind of like, an ostrich skin texture on the outside.

Dolly: Mm-hm. It also goes smoother in texture. When it goes yellow, it's mature.

Alie: Then you know, it's just like a green light. You're like, "Okay, sweet, get that." How do you get up there?

Dolly: So, we maintain our trees by pruning every year. You got to at least have 12 feet high in order for us to get all the fruit. So, it's just me so I have fruit pickers. I just load them in the truck and that's it.

Alie: How do you make sure that there's not a bunch of breadfruit on the ground just being wasted?

Dolly: So, I try to every time I harvest, I would know "These ones would be ready by next week." Or if something happens, I don't turn up next week, I know they're going to be ready so I just take them ahead of time.

Alie: Oh, and they can ripen off the tree?

Dolly: Yes, they can.

Alie: Oh! Kind of like a banana or apples. Have you always studied fruit?

Dolly: No. *[laughs]*

Alie: No? How did you get into this?

Dolly: So, I started with Noa Lincoln as a master's student from Sāmoa. I came here in 2018 on a scholarship, but I was mainly focusing on soil fertility. And then he had this grant on breadfruit and I jumped it. And then I'm from Sāmoa, we eat 'ulu all the time so yeah, it's perfect.

Alie: Do you have a way that you like it prepared?

Dolly: So, I'm traditional. I like it the old way of putting in coconut milk when it's, like, perfect maturity, a little bit soft, but still firm, and then you peel that and put in water, boil, take out the water, and put coconut milk. Yeah, that's my favorite way.

Aside: Okay, let's say that you plant one, but you're hungry and impatient.

Jarrett: And it takes how long for a tree to produce fruit in the first place?

Dolly: From, like, three to five years, you'll get fruits. And then I've read in literature that it can go up to 50 years, it will still produce.

Jarrett: That's just so much year-round. Are there ways to preserve it for the off months?

Dolly: So, there is one island that used to do a lot of the fermenting. They dig a hole and put all the 'ulu inside. We have new organizations now like 'Ulu Co-op that takes all the fruit and then make use of all that harvest; they froze it, they dry it, they pre-cook it. Yeah, they do all sorts of kinds of stuff. Yeah, flour.

Alie: Do you have any tips for anyone who either has a breadfruit tree or is thinking about planting one? Like, any tips on how to make your trees happy?

Dolly: Well, as long as they're in a nice, cool environment and with space, because 'ulu are big trees and they require space to grow in. Keep watering them every day and good soil...

Alie: They'll be happy.

Dolly: Yeah, they'll be happy.

Aside: And of course, location, location, location. Breadfruit is grown successfully in 90 countries throughout South and Southeast Asia, and Madagascar, the Caribbean, and of course, the Pacific Islands. Now, if you're in a tropical region, pretty much good to go. But apparently, like many Americans, breadfruit hasn't been able to thrive in Florida. Mexico and Brazil though, have breadfruit.

Alie: And be patient with them for a couple of years, right?

Dolly: Yes. Within three to five years, you'll have fruits.

Aside: So, Dolly says that these ones can grow up to 50 feet tall, but some breadfruit trees can be 85 feet tall! Like an eight-story building, almost 30 meters. But they prune theirs back to help with airflow and to reduce the chance of disease that can flourish when these dense leaf canopies stay too moist. They also prune them to keep them about 12 feet high just for practical ladder-climbing reasons. I mean, you try getting breadfruit out of something the size of a building.

Alie: Ever been bonked on the noggin by a breadfruit?

Dolly: Nope. *[laughs]*

Alie: Knock on breadfruit trees, right? I imagine you'd have to look up if you're picking 'em, make sure nothing's coming down.

Dolly: Yeah. You have to just make sure you're holding it so it doesn't drop and make sure no one's... *[both laugh]* It might fall on there.

Alie: Do they shatter when they drop? Like, if they're ripe, do they...

Dolly: If they're ripe, they do. They like... *pshoo!*

Alie: And then you're picking up breadfruit off the ground?

Dolly: Yes. But we take them before that stage.

Alie: So, they're not just goopy goops?

Aside: So, some cultivars are round and spikier, others are egg-shaped like a big green spaghetti squash with smooth reptile scales. I wanted to cradle one like an infant and tell it it was doing a great job.

Dolly: So, I did bring some fruit pickers *[Alie screams excitedly]* in case you guys want to pick some 'ulu and take with you.

Alie: Oh wow! I didn't know we'd get a souvenir. That's so cool! I had no idea... So, this is the part where you don't stand under it? Right, unless you want a concussion.

Dolly: Yeah.

Alie: Oh, look at that! Yeah, it just plunks it right down like a little baby in the grass. Hello!

Jarrett: Cool!

Alie: Fell how— That's so heavy.

Dolly: Yeah, you need muscles for this kind of work.

Alie: *[laughs]* Oh my gosh.

Dolly: Yeah, who needs to go to the gym, right?

Aside: And Dolly bounces between sites doing fieldwork as she's a third-year PhD student. And just the day before, she was on Kaua'i to collect soil and leaf samples at another breadfruit farm. You know, just island hopping, talking to plants.

Dolly: There's so much opportunity with breadfruit and it's fun and who would not want to come out to the open air and be away from the lab and be outside and do this kind of work? So yeah, it has been great.

Alie: Yeah, the fieldwork situation here is...

Dolly: The gym work, you mean?

Alie: Yeah, the gym work and the fieldwork. This was great. Thank you so much for letting us come and check this out.

Dolly: Thank you for having me.

Alie: I can't believe we got to pick some, see them picked! I'm excited to eat them.

So, ask scholarly people culinary questions and the answer might be Indigenous botany. Thank you so, so much to Dr. Noa Kekuewa Lincoln and Dolly Autufuga for hanging out on a dock and in an

orchard respectively. To find out more about their work and their mission, you can check out EatBreadfruit.org. We'll also link to the Chef Hui Fund donation page for them.

We are at Instagram and on Bluesky @Ologies and I'm @AlieWard on both. *Smologies* are our shorter, kid-friendly versions of classic episodes and they are in their own feed, you can find *Smologies* wherever you get podcasts, kid-safe. *Ologies* merch is at OlogiesMerch.com. All of this is linked in the show notes and also at AlieWard.com/Ologies/Breadfruit.

Erin Talbert admins the *Ologies* Podcast Facebook group, Aveline Malek makes our professional transcripts, Kelly R Dwyer does the website. Noel Dilworth is our scheduling producer, Susan Hale managing directs the whole shebang. Jake Chaffee is one of our talented editors. And producer, researcher, and additional writing for this episode was done by the lovely Mercedes Maitland of Maitland Audio. Thank you so much, MM for taking the lead on this so beautifully. Nick Thorburn wrote the theme music. And thank you also to Sam, Mason, Christine, Kyle and your PodMother, Jarrett Sleeper for going on this breadfruit adventure in Hawai'i. And the USC Storymakers Program for having me so that I could meet your scientists and I could pepper them with questions.

And if you stick around to the end of the episode, I tell you a secret. We got to the farm, two Australian sheepdogs barreled out of the gate like monsters. I stooped down to greet them and they mowed me over into the grass — this is within seconds of meeting Dolly — and they pinned me down with face licks.

[everyone laughing, Alie squealing]

Alie: Oh my god! This is heaven. Oh my god, hi babies. Hi babies! They're friendly. [continued laughter]

I loved every second. This farm trip was already a success by that point. Okay, thanks for coming along on the field trip. I hope you had fun. Okay, berbye!

Links to things we discussed:

[Cultivation potential projections of breadfruit \(*Artocarpus altilis*\) under climate change scenarios using an empirically validated suitability model calibrated in Hawai'i](#) (This study has a [great map](#).)

[A Breadfruit Tree in Every Yard](#)

['Ulu Production Practices](#)

['Ulu Lā - 'Ulu Chocolate Mousse](#)

[Real Food Encyclopedia | Breadfruit](#)

[Artocarpus](#)

[Interactions between People and Breadfruit in Hawai'i: Consumption, Preparation, and Sourcing Patterns](#)

[Pre-Contact Vegetation and Persistence of Polynesian Cultigens in Moloka'i](#)

[From forests to farming: identification of photosynthetic limitations in breadfruit across diverse environments](#)

["Searching for Sustainable Agriculture in Hawaii" in "Thinking Like an Island: Navigating a Sustainable Future in Hawai'i",](#)

[Cultivation potential projections of breadfruit \(*Artocarpus altilis*\) under climate change scenarios using an empiric](#)

[Impact of microclimate on *Artocarpus altilis* \(Parkinson\) Fosberg var Ma'afala fruit and nutritional quality](#)

[Interactions between People and Breadfruit in Hawai'i: Consumption, Preparation, and Sourcing Patterns](#)

[Hawaii's life zones](#)

[Breadfruit originated in New Guinea and the Indo-Malay region and was spread throughout the vast Pacific by voyaging islanders](#)

[Breadfruit \(*Artocarpus altilis* and hybrids\): A traditional crop with the potential to prevent hunger and mitigate diabetes in Oceania](#)

[The tide of dietary risks for noncommunicable diseases in Pacific Islands: an analysis of population NCD surveys](#)

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