

## Audio Interview: Food Waste

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Hello, and welcome to this audio interview from the National Socio-Environmental Synthesis Center, also known as, SESYNC. SESYNC is supported by an award from the National Science Foundation to the University of Maryland. Join us as we bring together the science of the natural world with the science of human behavior to find solutions to complex environmental problems. I'm your host, Erin Duffy.

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Food. We all need it and most of us love it. It keeps our bodies moving, sometimes encourages us to learn new skills, and brings us together. But what about the food that goes uneaten? Well, there is hardly a person today who is not aware to some extent that food waste, especially in the United States, is a problem. But here at SESYNC we are focused on finding solutions—solutions to, as we've said, complex environmental problems, and food waste is no exception.

But how do we do it? The answer is interdisciplinary science. Today we're talking with Dr. Quentin Read about his research to find real-world solutions to this intractable situation; and how these efforts are one piece in a larger puzzle to create a more sustainable food system.

Quentin is a data scientist at SESYNC who helps international teams of researchers process, analyze, and manage big, complex datasets. Starting out as a postdoctoral research fellow at SESYNC, Quentin and his team focused on modeling the impacts of the food system on human and natural communities by using techniques from ecology, environmental science, and economics. Let's hear what they've found:

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**Erin:** So, thank you, Quentin, for talking with us.

**Quentin:** Thanks for having me on.

**Erin:** Could you start us off by telling us how you got into this field and where it has taken you?

**Quentin:** Yeah, so I guess I'll just tell you my whole life's story real quick—the two-minute version because it's all relevant. Yes, I'm from North Carolina, and you know, way back when, I studied environmental science as an undergrad—and that's how I got interested in these types of socio-environmental questions.

However, for my PhD, I went more into the weeds of ecology—pun intended—becoming a plant ecologist and doing field work. Then after that, kind of got more interested in the macroscale—the big scale patterns—working more with data, and that's what I started focusing my research on and kind of through that, came to SESYNC where I joined one of the interdisciplinary teams as kind of their data analyst as a postdoc. And the question this team's focusing on is the environmental impacts of food waste.

And so coming to that, it was a little bit like coming full circle from my original interest that I had when I was a young boy, you know, enrolling in college. And so now that the group has kind of disbanded and

finished their research cycle, but I've stayed on at SESYNC as a data scientist—a member of the data science team—supporting the other researchers and I'm still continuing to work on the food waste research that I started here, for part of the time as well.

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**Erin:** OK, awesome. So let's talk about food waste specifically—how big of a problem is it worldwide?

**Quentin:** Yeah, so I mean there's a little bit of, I wouldn't say controversy, but definitely a little disagreement on exactly how much food is wasted throughout.

So here, let's step back, when we say food waste, we're talking about anytime food is grown or produced with the intention of feeding a human being that doesn't end up reaching that goal for some reason. And that can be, you know, produce that is not harvested and left to rot in the field. All the way to, you know, it spoils while it's in the truck going to a processor. Or it, you know, isn't sold at a store and is thrown out. Or even, it spills off your plate. Or rots in your fridge—any of those things, we consider food waste. And so, you know, it's a big thing, with many causes and many manifestations.

But, if you put it all together, you know, somewhere between a quarter to a half of all the food that is produced—in, well, at least in the United States, so we're talking here about the U.S. and developed countries—is wasted.

**Erin:** So how does the U.S. compare to other developed countries?

**Quentin:** So yeah, well first, just to draw a distinction between the problem of food waste in the developing world is a problem of infrastructure. You know, they often do not have the technology that they would need to keep their food from spoiling. For example, you know, they don't have adequate refrigeration capacity to store all the food they produce. That's a failure of infrastructure.

In developed countries like the U.S., obviously, for the most part, we have adequate infrastructure. But, I would say, we face more, sort of, economic and cultural drivers of food waste, where, for example, you know, there just might be an incentive to waste food. Like a retailer might make higher profit if they keep the shelves stocked with really fresh produce, 24 hours a day. But, you can't really do that without having to throw a bunch away. But that's what makes them the most profit and that's why they do it. Then I think the data show that the U.S. is not doing very well even relative to other developed countries, in that we tend to have a pretty high rate of food waste compared to a lot of other developed countries, like European countries.

**Erin:** So, in some parts of the world, it might have to do with infrastructure, and in our case, it might be more culturally based.

**Quentin:** Exactly—yes. So, yeah, I guess I was talking more about the economic side, but yeah, you could also imagine cultural drivers, especially in the home. Let's say you have company, and you want to show you're a good host, so you put out more food than you know anyone will be able to eat—I mean some's going to get thrown away, too. So, that would be an example of a cultural reason of food waste.

**Erin:** There's different drivers, obviously, so there might be different interventions that are appropriate. But, could you talk to specifically the U.S., based on your research, where are these areas that could use improvement? And what are we going to do about it?

**Quentin:** Yeah, so, as I mentioned, the concept of incentives. You know, that's something that comes up a lot when you're talking to economists. A lot of people I'm working with have an economic background on this project. You know, one example of a place where incentives are kind of backwards and need to be changed, in order to reduce food waste, would be on the farm.

Our system is kind of set up to favor the middlemen, or middle people, in the food supply chain. For example, a farmer has to sign a contract with a buyer—they contract to provide a certain amount of produce to that buyer, okay? And if they don't meet that contract—that's bad for them, they lose money. But if they produce more it doesn't really hurt them that much. But it also—they have no way of selling that excess because they didn't contract to sell it. But they can't just plant exactly as much food—as much acreage as they would need to meet that contract because what if some of the crop fails? You have to plant a little bit of extra as insurance, so they might err on the side of caution and plant—overplant—way too much, a lot of extra is produced but, they literally couldn't sell it no matter what. And it costs money to pay people to harvest that and, you know, run the machinery to harvest that, so they're just not going to do it, and it's going to rot in the field. That's essentially a perverse or backward incentive that would cause food waste. Ultimately, we can think about a lot of different solutions to reduce food waste, but none of them are going to really stick unless these incentives are reformed somehow.

**Erin:** So, you're saying we do need some amount of food waste? There's always going to be some because farmers kind of have to plant more in order to meet the need, but maybe it's a little bit exaggerated because of the way the incentives are set up?

**Quentin:** That's right. I think when you think about making sure that we are able to provide food for everybody who needs it, no matter what happens, then you are going to—in order for that system to be a little bit resilient and robust to disruptions —ou need a little bit of extra as insurance and so you know, some, some waste is inevitable—I think we're way past that—so you know the optimal amount of waste is not necessarily zero, but it's much lower than where we're at right now, that's for sure.

**Erin:** There's obviously been a lot of research into food waste, how does your research differ?

**Quentin:** The way that we kind of wanted to bring food waste research forward a little bit is that I feel like a lot of the discourse about food waste has two shortcomings.

The first one is that there's a lot of work that is done on documenting the problem of food waste and what a big problem it is. I mentioned the 25–50% of food wasted...

I didn't even mention yet the environmental degradation that's associated with that. It's because of the fact that when you waste food, you're wasting all of the resources and environmental impacts that were used to produce that food. Our environmental footprint of food waste is huge. It's well, again, about a quarter of the environmental impacts of the entire food system, which could be—that is equal to a very large portion of all the water used in the United States, like 20% of it is used to produce food that's wasted—that's all the water—not just agricultural water. And, you know, a pretty high percentage of the carbon emissions too—like 10% maybe.

...Right, so a lot of work has been done and a lot of ink has been spilled talking about this problem, but not that much in terms of actually evaluating solutions to the problem. That's kind of something that we

really have been focusing on, is trying to rigorously compare different solutions to food waste reduction. That's one shortcoming we're trying to address.

Another one is that a lot of times I think there's almost a falsely optimistic narrative that reducing food waste is a win-win, or even a win-win-win, as Michael Scott said in "The Office." It's a win-win-win if you reduce food waste because you're helping the environment by reducing resources, businesses are saving money, and consumers are saving money. If that were the case, this already would have happened. I mean if something is that good, you know, people would already do it. So clearly there are trade-offs that are being ignored. And so those are two things that we really wanted to try to hit in our research.

And a third thing, that I haven't really been able to fully address, yet, but, is part of my grander vision for the future of my research in the food system, is to incorporate impacts on biodiversity from food waste and from food production and trade more generally into the analysis because I think that's something that—it would help with the messaging from non-profits and conservation organizations if we could really point to how actions taken to reduce food waste—if we could specifically say—how that would benefit biodiversity. That's something that's kind of tangible and that would resonate with people. So I think that's—I'm really trying to bring that into the picture too.

**Erin:** That's awesome. So how do you conduct that research?

**Quentin:** Basically the way that we—I won't get too far into the technical details of it—but, I've kind of taken an approach from economics and environmental science, which is basically a modeling approach where we—in a very crude way—simulate the entire economy of the United States or all the transactions between different individuals or different companies and consumers in the food supply chain and how the flows of money are moving.

Then we associate that with flows of materials and then flows of environmental impacts. So then we can say, okay, if, you know, somebody down the end buys a dollar's worth of bread, what all impacts had to go into that. It's the wheat, it's the steel to make the machinery, it's the fuel that was used to burn and generate fertilizer to grow the wheat and things like that. All that has environmental impacts. And then we can say, okay, that's what it's like in the baseline case; and then if we simulate different solutions to reduce food waste, what are the impacts in that alternative scenario? And how much—essentially how much impacts would we save? How much would it cost to make that alternative scenario happen? And how much benefit would be realized from it?

**Erin:** Oh, cool, okay. So you kind of work backwards a little bit, in a way?

**Quentin:** Essentially, yes. So yeah, it's basically, it's basically driven by consumers and changes in how much is being consumed. But we can also—we can work from that end, but you can also sort of manipulate the inner workings of the economy. Let's say if manufacturers implement some technology to reduce food waste that would kind of change how much impacts would go into each amount of food that consumers end up buying—so you could work both ways.

**Erin:** And you've kind of talked a little bit about where you want your research to go as far as you want to incorporate biodiversity—could you talk a little bit about what you consider to be the levers of the food system sustainability as a whole because right now we're kind of focusing on food waste, but there's a lot more to it than that.

**Quentin:** Yes, thank you for bringing that up because as I mentioned I have a grandiose vision of where I want my research to go. And right, so solving the food waste problem is not an end in itself. It's just a means to an end. What we really are interested in is sustainability, right? That's the name of the game. We want to try to feed everyone in a way that can be maintained in the long term without degrading the environment. Food waste is just kind of a handy way to get people's attention because I think one of the reasons that it's gotten so much attention is because it...in DC for example, you can kind of get bipartisan support for reducing food waste.

Because on the conservative side, you can make that business case, you know, like we're saving money and the kind of win-win narrative that I was kind of disparaging a little bit before—you can make that business and environment people both happy by saying we're going to reduce food waste. But, that is only a means to an end of sustainability. If we want to really think about that more broadly, food waste is just one of the levers—you can call it like a lever—like, some way that we can work on the food system to make it more sustainable.

Other ones that I think are going to be equally important as food-waste reduction moving forward would be thinking about our diets. For example, making our diets more sustainable. One way to do that would be to reduce the percentage of animal-derived food that we eat and increase the plant-based food.

Another thing is thinking about sustainable ways to use technology to increase agricultural yield without just increasing the resource inputs—that's a tough one, but it's an important one.

And finally, thinking about the globalization of agriculture and trying to transition to a more regional model, where we try to strike a balance between producing the most efficiently and also producing things locally, without having to put them through this very resource-intensive global system, where things are shipped all over the place, many times, before it finally ends up on someone's plate. Those are all things that are going to have to be done in concert to make the food system more sustainable.

So that's...reducing food waste, making sustainable changes to our diets, sustainably using technology to improve food production, and also transitioning from this global to more regional model of agriculture. And all those things have interactions. Sometimes there's synergies where you can work together and solve multiple goals at once and some kind of have trade-offs and work against each other. So, it's a really tough problem to think about.

**Erin:** Do you and your collaborators make recommendations to entities based on your research and what might that look like?

**Quentin:** I mean we haven't directly done so yet,—that's another thing that I'd like to do moving forward actually. Recently we thought of an idea of—and this is something that hopefully will get funding—my SESYNC mentor from my former postdoc and I are thinking about getting funding to do, is to essentially make something like a decision support tool or a piece of software that policy makers, like people in the USDA for example, could use to look at different food waste solutions and assess how much they would cost, what the benefit would be—both financial and environmental benefit. So if we can get that into the right hands, that's something that could help set policy agenda. We are not directly recommending any specific course of action, but hopefully we'll be able to give people the tools to assess different options.

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**Erin:** Let's get into COVID-19. What's your opinion about how COVID has impacted the food system broadly?

**Quentin:** I think the COVID pandemic, as it has exposed many shortcomings and vulnerabilities in our society, right? I mean, I don't even have to go into it, but the food system is no exception. Basically, thinking back to the beginning of the pandemic, maybe we should have anticipated it a little bit more in advance, but there was no preparation it made in the run-up. Everything just shut down all of a sudden, like out of the blue. No one had prepared for it. And so there was a sudden crash in demand for food, especially, food service industry, restaurants—which if you look at it, is a huge proportion of the food consumed in the United States. By the monetary value, over 50% of food consumed in the United States is from the food service or restaurant industry. So once that all crashed, there was a big shock to the system. There were, as I mentioned before, these contracts that were baked in. There was no buyer anymore for some of that food. And so it just got wasted. You know, you saw, or you may have seen news articles showing milk being dumped out and food rotting and things like that. That happened, at least in the short term—I would say. The system didn't respond immediately,—I mean there's no way it could, I mean, to something like that. But there have been kind of responses that have occurred over the last few months that have restored a little bit of equilibrium. So you're not seeing the levels of food waste now that we were in the initial month or two of the pandemic. Which I guess is a good sign, you know, it means that the food system is at least a little bit able to respond to these types of things.

**Erin:** Yeah, I mean if you think about it, it's actually kind of pretty impressive that it hasn't been more of a disturbance—it was a huge change in how we consume things, how we're able to produce things. I mean, maybe they weren't able to have workers in a meat packing plant or you know, migrant workers, you know, things like that. It's kind of amazing that we're not all starving.

**Quentin:** Yes, and as I said, I'm not really the expert on this because the sort of modeling approach that we take relies on these data sets that are generated every few years, and so it's not really the best approach to look at these changes in real time that happen over a period of weeks or months.

But, yeah one thing that I did also want to bring up is another factor that has influenced the way the food system responded to the COVID pandemic is tied into globalization. And so, this was a story that was kind of developed before the pandemic is that in the United States in the last few years, a lot of pork production has been bought up by Chinese interests. So a good portion of the swine, pigs, being produced in the United States right now are being shipped to China. And as it turns out, pork plants ended up being the most highly affected by the COVID-19 situation, which is kind of just a quirk of the life cycle of a pig, right? If you think about poultry—the industrial chickens that are raised in this country—they have an incredibly fast life cycle because of the way they've been bred. They could kind of respond very quickly to changes in demand since the chickens live for such a short time. And if you think about cattle, they live for a long time and so, also not a problem, because you can kind of just keep the cows around and wait until the market, you know, changes again. It's not a big deal if the demand changes in the short term. But, the hogs ended up being right in the middle, right? They kind of have an intermediate lifespan, and so it turns out, they kind of had to really take a big loss when COVID hit because they couldn't get rid of all those hogs. And so they ended up having to be slaughtered and not processed. And they also ended up having to close a lot of those plants for worker safety reasons because they didn't want the workers in those plants to get COVID. So that just shows the interaction

here between these environmental issues, global dynamics in agricultural trade and human health. Again, not something that I'm an expert in but something that I think is really important. So it remains to be seen what effect that will have in the long term, but that was sort of the more short-term effect.

**Erin:** Ok, great, well is there anything that you would like listeners to kind of take home with themselves as far as you know what they can do, maybe, to increase the food systems' sustainability?

**Quentin:** Yeah, I think that's an interesting point because you know that's always a big question when it comes to these environmental issues. Like, what can I do or even what should I do? What is the individual's responsibility to deal with these massive global problems—how is one person going to do anything? I've struggled a lot with what to say about that kind of thing, but I think that the answer falls somewhere in the middle.

We have two responsibilities. One is to make sustainable changes in our daily lives, not because that's going to solve the problem, but because if enough people do that it can lead to sort of social tipping points where behavior can change on a large scale. I think that's very important. But also just to be cognizant of the more systemic problems and how all that's related—the food sustainability, food security, like I was talking about, making sure everyone's fed, equity of access to food—those are all related. I think we need to try to think about making sure that our policies try to meet all of those goals. But, again, there's no true win-win-win. There's going to be trade-offs when you're thinking about that many goals that you have to meet. And so we just have to make sure that we can, you know, make a resilient, and safe, and sustainable food system. And I think that that is possible. It's not just going to be individuals who do that—we need a strong commitment from our governments to enact policy to bring that about. We just need to continue to advocate for our elected officials to do that.

**Erin:** Well, wonderful, well, thank you for doing what you do. And yeah it's been great.

**Quentin:** Well, I'm really happy that I had the chance to chat. So thanks a lot.