ESF Campus Conversations THE PODCAST

Season 8, Episode 3: Economics of Sustainability
Host: ESF President Joanie Mahoney
Guest: Mariela Cavo + Tim Volk

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Tim
When we think about sustainability, one of the three sort of pillars of that is economic sustainability. We need to have that. And to have folks that can understand that and do that analysis is absolutely essential.

Mariela
there are markets in which we have these failures, and we need to do something about it. How can we do that? How can we fix this market failure? How can we internalize this.

Tim
I think something that's great about ESF is that this interdisciplinary work has always been part of what we do.

Mariela
Something that used to be waste, for example, can, become something of economic value and environmental value. So we are looking at new products that could become part of that portfolio and that could represent potential revenue.

Joanie
Welcome to season eight of Campus Conversations, the Podcast. I'm Joanie Mahoney, and I have the honor of serving as SUNY ESF president. This season, we're working to further explore the interdisciplinary connections of our ESF community. The work our faculty, staff, and students do matters now more than ever, and I'm honored to welcome Doctor Mariella Calvo and Doctor Tim Volk. Welcome, and thank you very much for joining me at.

The feedback on these conversations has been really great. And I've said this to, people who have done this. I just feel really lucky that I get to talk to people that are so well versed in their subject matter as you and the fact that you stop what you're doing and share it with everybody is something I'm really grateful for.

And I will let you introduce yourselves. But I'll just start by saying Mariela is an assistant professor in the Sustainable Resources Management Department. Tim has over 20 years of experience working in the fields of forestry, agroforestry, short rotation woody crops, bioenergy and phytoremediation in the Northeastern United States and Africa. Tim is a professor in the

Sustainable Resources Management Department, and if you're asking why they're both on this episode, Mariela and Tim worked together in the Bio-economy cluster, which is a cohort of remarkable educators and researchers across departments who have focused on the bio economy.

But let's start with you, Mariela, how would you define what the work is of the cluster that you're involved in?

Mariela
Well, our work is, interdisciplinary, actually. It's not just like one specialist or one expert working on one topic. It's actually a group of people working together on different areas in the environment, economy, social, cultural.

Joanie
You know, we hear that word interdisciplinary and understand that people with different backgrounds are coming together. But how does that work? Do you do common research together?

Mariela
We do actually. I am, an environmental economist, or I will say natural resources and forest resources economists to and, one of my challenges or, purposes, I guess, is to make people see that economics is everywhere. Right? And that could be part of every research project that we have, going on. So, yeah, we all work together on different projects that have different components in, there are different next principles. And that work helps us actually see the part that we do in a different way. Right? Instead of just, paying attention to, let's say, the cost of something or the benefits of something, I can also start looking at it from the perspective of people doing chemical forest management.

Joanie
Okay. I'm interested. So, I know Tim, you have a lot of experience in the biomass research. So how would having an economist working with you on the research that you do complement your research?

Tim
Yeah. So it's essential. Right. So if we just take the word bio-economy there it is. Right. It's about the economy. And the bio part is really just identifying the part of the economy where we're using renewable biomass resources.

Whether it's a feedstock input. Right. And we have them already. We have a bio economy and agriculture, forestry. Think about the enzyme industry that we use enzymes for all sorts of different

things. Right. So it's already exists in the economy. Part of it's essential if you're going to have an impact and change our systems. Right. And use more bio and less fossil energy or fossil resources. It's got to be economic, right? So when we think about sustainability, one of the three sort of pillars of that is economic sustainability. We need to have that. And to have folks that can understand that and do that analysis is absolutely essential.

Joanie
If you are doing research on the effectiveness of subbing biomass for a fossil fuel source, we can't fully understand that or implement it at scale. If we don't understand what the costs will be.

Tim
Absolutely. And it's not only cost, but it's then the benefits, right? And first of all, you need to understand if we make this transition, will some company that's going to make an investment be viable. Right. So that's sort of at the business level understanding those economics.

But we also want to understand how it's going to affect the overall economy, whether it's in the state or in the country or globally.

We need to understand those sort of impacts as we make these transitions. And so it's absolutely essential to have people who have that background and expertise to be able to help us understand that and, and then identify where are the pitfalls. Where might it not work or where do you have to then focus.

So maybe the economics don't work. Let's identify the part of the system where the efficiencies are low or the costs are too high. And then you apply the research okay, let's try and address that. Let's make the process more efficient. Let's lower the cost of the feedstock or the processing.

Joanie
The transportation.

Tim
Transportation. Right. And then we can apply the research once we understand the economic system. Right. And where the strengths and weaknesses of it are.

Joanie
And it is crucial because, you know, people with just a surface level understanding here, oh, it's too expensive for us to switch to these sustainable energy sources. Right. But that's just a soundbite that somebody has heard. Right? It's just so expensive for us to use solar panels. So for us to use wind turbines. But, you're doing the work, Mariella, to show us how we can make this biomass work so that it's not too expensive for us to make this transition.

Mariela
Yeah. So as economists, what we do is to look at all the costs, look at all the benefits, and see if the net benefits are positive or if they are negative, or if, what are the different approaches that we have? And which of them is the most, cost effective one? Which of the approaches could help us reach our goals at the lowest cost possible?

Joanie
How interesting. And Tim just said it's also workforce, right. So that is a big part of what we're doing is training a workforce. And so what of these different options that we have creates a viable workforce in this sustainable energy industry.

Mariela
Yes. And we have to assess the impact on the number of jobs that these industries create, right. Or the number of jobs that will disappear when we switch to a different industry.

So one thing is that there are two different type of analysis, and one is called economic impact analysis. And the other one is called economic contribution analysis.

The main difference between the two of them is that an economic impact analysis is, trying to answer the what if question. What would happen if this industry cease to exist? What would it be? The impact on the number of jobs, for example, or the impact on the, value added, which is, GDP?

And while the economic contribution analysis uncertainty, what is question. What is right now the economic contribution of, for example, the forest sector in New York State. When we are talking about switching from one industry to like, for example, fossil fuel to cleaner energy, we are talking about the need of, performing economic impact analysis to see what would be the, impact on number of jobs and level of outputs produce or labor income. For example.

Joanie
How does being an economist in this discipline differ from an economist elsewhere?

Mariela
I will say, actually, I could answer that question based on my experience. I was working, Lemoyne College before coming here and I was in the economics department. It was like more pure economics. Here, just looking at the economy as environmental economist or as economist, natural resources, economy. And here we are not just learning about markets, that interaction between suppliers and consumers get into that, market equilibrium. Right. To maximize benefits, we go farther and here I'm allowed to look at market failures. The invisible hand is very powerful, but sometimes it fails. Sometimes we have this negative externalities where private firms don't take into account those social costs that there wasn't. Right. They just take into account the

private profits the private caused. But they don't take into account, for example, that during their production process they emit some pollution and that those pollutants are making people sick, for example, they don't take those costs into account.

So, working here in environmental economics that allow us to be aware and there are markets in which we have these failures, and we need to do something about it. How can we do that? How can we fix this market failure? How can we internalize this?

Joanie
So it's a more holistic way of being an economist. Maybe it was what I'm hearing you say and in my experience, we as a society have had to kind of come along behind industry and clean up some of that mess that wasn't accounted for.

You know, I'm thinking specifically about Onondaga Lake. Industry polluted Onondaga Lake and decisions were made by companies that it was the most efficient way to deal with the hazardous waste.

And if you're going back in time and saying, what's the profit and loss decision about disposing of this hazardous waste by polluting a water source? If we could go back to those same people and say, the people that are going to buy your company 50 years from now are going to have to put $500 million into a clean up plan because the federal government is requiring them to do that. That seems like something that they could avoid by having somebody like you that's looking at all of those costs before decisions are made and not simply, you know, the cost of the dump of the hazardous waste. But what is the long term impact of that decision, and what are the costs going to be associated? Is that a fair assessment?

Mariela
Actually you mentioned some important points there, and I think I can't avoid thinking about environmental impact analysis or any new activity that we are going to be performing, any new industry that is going to exist, we need to perform those environmental impact analysis. And then when we sit at the impact analysis, we use different techniques to put dollar amounts to those impacts.

And then we can look at the benefits and we can look at the cause. The approaches that we have are not perfect yet and we keep working on, improving them. But we do have some approaches that allow us to put dollar amounts to things that are non-market goods and services, right. Or benefits and costs.

Joanie
So Tim, you've been doing this a little bit longer. How has this person who's focused on the economic benefit or doing this economic analysis? How has that changed your research?

Tim
Yeah. So like Mariela was saying, like accounting for these benefits and costs, these externalities, right, is important. I don't do that. I mean, I can measure some of them, how you translate them into dollars and put them into terms that people understand. Right. So if I'm measuring changes in, I don't know if soil carbon or air force carbon dynamics.

Right. So most people don't understand that kind of stuff and it's not impacting them as directly. We put a dollar value on it. People start to understand it better. And ultimately these cost benefit analysis. Right. People want to do it in a term they understand. So as Mariela was saying, that's the challenge. How do you translate this information about the ecosystem or the services that the ecosystem is providing and put them in a dollar term.

So clean water, Onondaga Lake or any other place, right. There's a value to that. How do you value that. Right. Well, yeah, we need someone like Mariela to figure that out. In my mind, it's a way that people understand. People understand dollars and cents more than they understand what the biological oxygen demand level is in Onondaga Lake, right.

Joanie
Right. Right, right. Or whether the phosphorus is 0.04 or .03. Right, right, right.

Mariela
And can I have something to is that the work doesn't stop there. Right. We also need to look at who is going to bear the cost, who is actually going to pay to clean up Onondaga Lake, or who has been paying all these years to clean up, Onondaga Lake, right. Like the firms have, like some level of responsibility, maybe some of the users, some of the households that are around, or maybe the local governments too.

So we, need to look into laws. We need to look into property rights to. Who has the right to have a clean lake and who should be bearing the costs, who is going to be enjoying the benefits.

Joanie
So what you're talking about now helps me understand why a cluster hire would be beneficial. Because Tim's looking at the actual science of the plantings and the effect on the soil and the, carbon sequestration, but also what plants maybe clean that soil. And then you can help translate that into, economics for us.

But there's a role for policy people, right. And everybody's busy lives. If you're saying this company polluted this and they have to clean it up, you can think that doesn't really matter to me that much. But if you can put a value on the clean lake or on, you know, clean water and help people to understand that that's something of value to them and it's being taken away, then I would imagine you would have an easier time convincing people to care.

Mariela
Yes, I agree. When I talk to my students, I always make sure that they keep in mind the value is a relative concept, but not an absolute concept. Something that you assign a high value, I might assign a low value to the same thing, because it depends on the context. It depends on who is assigning that value.

And yeah, when we determine, values, we can, talk to people and, see how much a specific community values Onondaga Lake, for example. Let's say, this year cuz, population how often do they go there and recreate there? And then we can have different techniques and put dollar amounts and we can say people from the city of Syracuse assign this amount of dollars to Onondaga Lake. That's how much they value the lake. And we can use this information to go to policymakers. And, try to get some money for sustainable management of the lake or.

Joanie
And then I can kind of imagine that. Right? I used to be a member of the Syracuse Common Council. And if you had come and shared that information, it's a lot more compelling to make decisions to protect that value.

So, Tim, I know your research in a couple different ways. I know it as crucial to cleaning up with the waste beds. And then I also know the woody, biomass for the combined heat and power plant. And you and I have also talked about the value of willows as natural snow fences. And certainly a huge value, in my wearing my through a hat. What's taking your time right now in your research?

Tim
Yeah. I think the, the big sort of press at a large scale, right, is how are you going to shift off these hard to decarbonize fossil fuels onto renewable sources. So passenger vehicles, right, a large proportion of them are going to go electric at some point. It's hard to do that. We're not going to do that by a plane in the near future.

Right. We're not going to do that with long haul trucking in the near future. Marine transport. Right. These are what are often referred to as the how to decarbonize sectors. Some industrial sectors are going to be harder to decarbonize because of the way they run.

Joanie
The heat they need.

Tim
Yeah. And the type of heat, the level of heat. So there's a lot of interest still in trying to use biomass to fill these, needs. Right. We need these fuels. Sustainable aviation fuel, renewable diesel,

because we need them to run our economy. So a lot of it is now focused on. Okay, how do we. So I'm a biomass production person.

How do you know I'm growing a carbon source, in essence that the bright chemical engineers can then take and turn into renewable diesel SAF. Right. Well beyond my understanding. But it's really focus on how do we do that most efficiently and with the biggest carbon benefit. And so how do you manage those systems, to optimize the price that needs to go to the industrial conversion facility to turn it into fuel needs to pay, and to have the best carbon impact associated? That's really the big focus at the moment.

Joanie
Does the technology exist in the marine world to use a biomass to transport across the ocean?

Tim
Yeah, certainly. So it's out there. People are making renewable diesel. Right. So this comes back to policy. We look at California and other states on the West Coast, Washington, Oregon. Right. They've got low carbon fuel standards which mandate certain, levels of carbon in fuels. Right. The renewable diesel industry out there has exploded. They're now producing, I think, some much around a couple of billion gallons a year. Whereas ten years ago they were producing minimal number. Tens of thousands maybe. Right. It's just because of the policy. It's changed dramatically.

So they're flying planes now with sustainable aviation fuel as part of the mix. It's occurring at this point in time with fairly aggressive goals, both in the United States and around the world, to ramp that up dramatically to the point that by 2050, people are saying we should be flying on all sustainable aviation fuels, not fossil jet fuel.

So I tell my students, that's 25 years from now. It's like, that's your career. This is the challenge in front of you is to convert systems like these hard to decarbonize systems into renewable systems.

Joanie
It's interesting to have you say that because in a way it's a gift for the students, right? You can see what's coming. These goals that are set if you go back, you know, I graduated, from law school in 1990. Nobody foresaw a lot of what's happened. I didn't have a computer on my desk, you know, I, I didn't imagine the internet. Right. I'd probably be pretty wealthy if I, if I had. But in this space, we do know where we need to go. A lot of people have quantified where we need to go to move the needle. And in, in a lot of ways, I would imagine that that is a gift.

I want to just back up a little and say that when I first started to hear about these biofuels, it was food. We were talking about corn making ethanol. And then there was a backlash about that. And so what we're talking about with you is not a food source.

Tim
So we did the corn ethanol. And with the federal policy, the target was 15 billion gallons a year of ethanol made from starch from corn. We do that right. It's occurring. There's I don't know, 130, 140 facilities around the country that make that conversion. And it's in our gasoline. Right. If people pull up to the pump and look right, it's 10% ethanol in your fuel.

So that's where it is. It's in the fuel supply. It's sort of become part of what we're doing. But you're right, there's concern about is that the best thing to be doing with food. Right. So here's my little side on this. Right. It's actually feed. So humans are not eating that corn that's grown that goes into the ethanol plant.

If anything is going to eat it, it's going to be animals. And the vast majority of that is going into animals to feed animals. There's a whole nother discussion about what we should be doing about our diets.

The thing to remember about ethanol is you put in the corn, you make ethanol, but you also make this stuff like all the non sugar, non-starchy, ends up in what's called distillers dry grain.

It's actually a high protein feed that goes back into the feed industry. It replaces soybeans. So you're making now ethanol. You're making an animal feed a high protein animal feed. You can also make, you get some corn oil out that they turn into biodiesel. Now you can take the CO2 off and bottle it, put it into the beverage industry or other places. CO2 is needed.

So they've evolved. These ethanol plants have. And part of it's economics, right. They've had to evolve. They could not survive if they only made ethanol. So they make multiple products. I'll sort of wrap there because that it gets complicated. But in my mind it's really a feed versus fuel issue. And what are we doing about our diets?

Right. Animals are not good converters of from an energy basis, right? From energy and feed to the meat or dairy products that are taking. So there's some work that could be done there. And, and actually, as we go forward and address the bigger changes and challenges, we will need to make some of those adjustments.

Joanie
And that phrase, ignorance is bliss, right? I sometimes wonder what scientists like the two of you must think when you hear non-scientists say something like, I did. That's food that's being turned in. Your explanation is so much more detailed and complicated and and how frustrating it must be. You don't get that benefit of ignorance being bliss, because you know what the depth of that answer is and what the breadth of that answer is.

So, you know, we we get these, one and two minute news stories and run with them and it's certainly not even scratching the surface of what the whole story is.

Tim
Yeah. You know what I said? That's just the way people take in information now. So the opportunity to talk about it for a minute or two is great. I just help people think about in a broader context. And so yeah, it happens a lot. But I see those as opportunities. But if you if you want to have a conversation about it, let's just talk about this. Let me give you some other perspectives to think about.

With my students. You know, so I teach a biomass class, this, this issue of food versus fuel because of what they've heard, right, is, it's a semester long. I mean, I come back to probably half a dozen times at different points in the semester and ask, okay, so where are you at on you're thinking? Let's talk about this again. And it's it takes time to think through some of the pieces and to think about a, think about it a little differently, because food versus fuel is a wonderful little phrase. Right, there was created back in the early 2000. And it's stuck, right? I mean, it's it is easy to grab on to. I challenge the students to think about it is it's fuel versus feed more than food.

Joanie
I'm kind of surprised that here, given the fact that our students are here because of their care and concern for the planet, that we haven't had that conversation a little bit more broadly. A couple of years ago with the president, we had a conversation about a possible resolution that they were going to work on about having red meat served here on campus because of the impact on the climate. And the conversation started and stopped, and I was kind of surprised by that. I thought that it would happen quickly. When you're looking solely at the impact on the climate. And forgetting, you know, animal rights and health benefits and all of that, but maybe, maybe that'll come. Maybe the students will take that back up again. But that certainly affects that conversation about fuel versus feed, right?

If you don't need the feed, then it becomes kind of a moot conversation.

Tim
So here's an interesting little thing about the, this is a bio economy thing, right. So, you know, you can go to any grocery store now and buy plant based burgers, right? Beyond Meat or whatever the other ones are. Ten years ago, I mean, I remember sitting at a conference down in Tennessee, and there was there was one of three facilities in the country that was serving this stuff.

And we were at a biomass conference. So we all had to go right and try this thing out. And ten years later, it's just part of the economy now. And you can go to the store and make that choice and buy burgers that are all, you know.

Joanie
Ants.

Tim
Yeah. Right. And they're not just the old sort of black bean type burgers, right? These are engineered, bioengineered materials that look like meat. Tastes like meat. Right. So we're going to as we make this transition right. There's going to be some interesting things that will happen and maybe things we don't expect. But those are also biomass based off part of the bio economy and an alternative to the way we've traditionally done things.

Joanie
How about you, Mariela? So what is your current focus? What are you working on right now relative to this conversation?

Mariela
So following up on what Tim, just said, this is a very important way of diversifying the stakeholders portfolio, right? Something that used to be waste, for example, can, become something of economic value and environmental value. So we are looking at new products that could become part of that portfolio and that could represent potential revenues, revenue that could help cover the costs of production.

Let's say, for example, in forest management. And this is something I've been, working on right now. We are working on finding better technologies to dispose of forest, fuel or wood debris in Long Island. This area, the Pine Barrens in Long Island, have been affected negatively by the pine beetle. So there is a lot of wood debris in, soil and that increases the incidence of wildfire. And we actually just saw it in the news the last two months, a month and a half, two different wildfires that happened there. It was in the news, just like a week and a half ago, the second one. And, if we reduce the fuel risk of having wildfire, decreases. Right. And there are different ways of ways of managing.

So when they.

Joanie
Say you'll you mean the actual wood that's there.

Mariela
Dead or even, dead trees there, right. There are no fallen trees, yet. And, so one of the ways of managing that fuel is, prescribed fires. But, we are looking into a new technology that is called Air Curtain Burners and is or we call that ACB's. And it's a machine that allows to dispose of fuel. We bring all the fuel that is in the forest, put it in there, and we burn it.

So there is an air current that traps the emissions. Right. And making them go down again and, reburn, these particles reducing the level of emissions of CO_2 or PM 2.5 going into the, air. So we

are trying to see if the level of emissions is really lower using ACB compared with prescribed fires to be able to manage the fuel.

But one of the potential benefits of this ACB's is that we can use, this machine to produce biochar. Biochar is, when this wood, this fuel is being burned, it produces something that is very similar to charcoal. It's just the way that it is produced that is different. But if you see it, you might think it is charcoal. But it has, a huge potential to improve the soil conditions and to also sequester carbon or to store carbon. I will say it.

So something that was going to be waste. Now we are adding some value to it. We are producing biochar. This biochar can be added into the forest that was treated that was managed for a fuel. And then we will see if, what the impact of the biochar will be on, regeneration, for example.

Joanie
So if we don't manage this pine barrens at all and the pine beetle has destroyed a lot of the wood, and it now poses a risk. So we have scientists here on our campus that can go and do a prescribed burn. And then I'm under the impression that that would be the end of that story. Right. And that all of that material would stay and help regenerate the soil, perhaps.

And we have soil scientists that would study that effect. What you're talking about is, is taking that instead of a prescribed burn and burning it in a particular way. That makes this something akin to charcoal.

Mariela
Yes, while reducing the level of emissions, too. So actually, it's good that you mention, the other disciplines because I'm actually working with Doctor Andrew Vander Yacht.

Joanie
Yes. Our expert in these prescribed fires. Yes.

Mariela
And I'm working with, Cole Gross, too, and Jamie Mirowsky from the chemistry department. So, it is, the soil component. We have the fire expert, and we have also the economic part of it. We can see if this new product that is going to be produced at the end of like managing this fuel can be useful for forest management, for forest, regeneration.

And it is actually, being sold in, there is a market for biochar already and, but this represents, a potential, as I wouldn't say alternative, but actually a complement to prescribe fires.

And, so we will assess the social perception, what people think about these prescribed fires. It's actually a very interesting time to be doing it because they just experienced two wildfires in the last month and a half.

Right. So it will be interesting to see what, these people think about the prescribed fires...

Joanie
... and probably a little more receptive to it this week.

Mariela
You need of managing the fuel in this area.

Joanie
So this is probably, a very simple question for both of you. But when you say that if you take this material and burn it in this way and reduce emissions, where does that material go? So if you if you have a prescribed fire and the emissions just go out into the atmosphere, that's A and then B is that we do it the way you're describing what happens to those emissions that aren't going out into the atmosphere.

Mariela
So, you know, if we decrease the level of emissions that go into one media, that level of emission has to increase in another media, right? But in this case, what we are trying to do is actually, something that was going to be in the air, gets trapped.

Joanie
So those emissions are part of the charcoal that you're making.

Mariela
So when we put the biochar back into the forest, we will be assessing for a few years and see what is the CO2 level there. So this summer we are actually collecting the base, data to see what what are the soil conditions. And then we will see what changes we have had. So, biochar has like, this, potential, to sequester carbon and then also a potential for a stakeholder in this case, we are working on, public lands for the research, and, but, for private stakeholders, this will represent a potential extra revenue for them while using biochar in their own land.
But also, market.

Joanie
I'm curious, could this biochar be a fuel source? In addition to a soil enhancer?

Tim
So I don't think people are necessarily looking at it as a fuel source. It's really what calcitrin carbon. So it's very stable, but it's got benefits in terms of nutrient holding capacity, water holding capacity. It's better to add it to a system, right. And grow something with it. The other markets for it are weight water cleanup.

Right. So it's very effective. Think of it's similar to active charcoal. Activated charcoal. Right. So you can use this to clean up water. That's a big application of it as well. Right. Because there's there's value in there. Like people have to clean up water sources. And so there's value in there. So there are these kind of markets that are developing around.

Joanie
Oh, I'm so happy for you that you get to spend your time on such interesting projects. But before we wrap, I'm curious about the rest of the cluster. Do we have other faculty that are part of this cluster right now?

Tim
Yeah. So certainly. So Mariela mentioned Cole Gross right. He was a hire. He's a soil carbon expert. Right. Soils in general. But carbon is really his thing. So he's on this project. He's on some projects that I'm working on. Great to have somebody come in and help you with those kind of things. Right. That I know a little bit about, but not at the level of detail he does. And to get those numbers and then hopefully we can translate them into value. Right. There's value in carbon stored in soils in multiple ways. So Mariela can take care of that for us. So other folks. We've hired people in chemical engineering. Right. Because we need people to take biomass. So Ankita is over in chemical engineering. Like to take biomass and turn it into these products. So we talked about fuels or bioplastics or other things that we don't that we want, but we don't want to make out of fossil fuels. So those other people are essential as well. Right. And it takes all those folks working together. Plus others to make it work.

Joanie
So again, you've been here 20 years or more because weren't you here before you were here?

Tim
I was, yeah, soft money for a bunch of years. Yeah.

Joanie
Have these clusters changed the way you work over that time? I mean, when you came in first started being, researcher here at ESF. Was it more siloed or were you doing some of this interdisciplinary work without the formalized clusters?

Tim
Yeah. So I think something that's great about ESF is that this interdisciplinary work has always been part of what we do. And you can't really manage natural resource systems: water, wildlife, soils, forests, whatever. Like with a single focus too complex right now. Mariela mentioned several times, the people portion of it. So it's always occurred, but not necessarily in a formalized fashion.

I think the other thing that this allows us to do, right, I would say it goes beyond interdisciplinary to transdisciplinary. And when I make that distinction, that's us working interdisciplinary. Mariela and I, an economist and a forest resource person. Right. And and now, like Mariela was just talking about it's outward focused, right. They're assessing and involving the public, either on the public lands or in the community. Right. And she's mentioned how these fires are impacting people's perceptions. Right. That's the transdisciplinary piece. It's not just us at the university working together. We go and talk with the people that are impacted either currently or could be impacted and try and find solutions that work with that in mind. Right. So and I think the clusters have allowed us to do that in a more focused manner because we have these other people as other perspectives that we can talk about. And when we go talk to people, we can present it in a different way.

But I, I can't value ecosystem services very effectively, like, but, Mariela can help me with that. And then we could go talk to people about the potential benefits in terms of they understand.

Mariela
And that's something that I would like to add too, is that it allows to work together, but it doesn't limit us. So even though we are part of a cluster, we are still working with other group of people, with other faculty that are not part of the economy cluster. We I work with the water cluster or I, I'm working with, from environmental studies department with Madeline Nyblade. And we are actually working more on these social and cultural connections to forest. Right.

So there are two projects actually, that I'm working on. One is with her, and that project is actually to find ways to return indigenous access and care rights to private lands through new types of partnerships with land owners. And the other one is actually in Honduras, where we are trying to find economic value of ecosystem services from watersheds, and we are paying more attention to water specifically.

And, the reason I wanted to mention that too, is because I'm from Honduras, so I still want to keep connections with Latin America. And, the cluster is not limiting me. I will say, actually, because I'm part of that cluster, it is actually allowing me to work in a broader, way, not just limiting everything to the U.S that's great.

Joanie
And it's one of the most amazing things really about ESF is that all of you, all of our faculty have this shared mission. So no matter who you're talking to or who you're working with, there are

connections for your research, with their research. And and I've had the opportunity to talk to some of the environmental studies folks about the value of having people here who can communicate that. You know, that's a really crucial part of this, is translating what you're learning or the buy in from the public is so important because we can put the solutions on paper. But to implement them, we're going to need people to understand what it is we're trying to do. So I think conversations like this go a long way to making that happen. And I'm really happy that Tyler Dorholt has found different ways to use snippets of this information in putting putting it out there into the world and asking people to come back and listen to the whole conversation.

So I appreciate you taking time to stop and explain to me what it is that you're doing. And it really is fascinating, and I appreciate both of you very much.

Mariela
Thank you so much for having us.

Tim
Yep. Thanks. For the opportunity.

Joanie
Thank you.

[MUSIC]