**Podcast Episode 4**

**USDA Rural Development: Financing Climate Adaptation**

**Interview with Fred Petok**

**Emile Elias:** Welcome to Come Rain or Shine, podcast of the USDA Southwest Climate Hub **Sarah LeRoy:** and the Department of Interior Southwest Climate Adaptation Science Center for Southwest CASC. I'm Sarah LeRoy Science Communications Coordinator for the Southwest CASC. **Emile Elias:** And I'm Emile Elias, Director of the USDA Southwest Climate Hub. Here, we highlight stories to share the most recent advances in climate science, weather and climate adaptation and innovative practices to support resilient landscapes and communities. **Sarah LeRoy:** We believe that sharing some of the most forward thinking and creative climate science and adaptation will strengthen our collective ability to respond to even the most challenging impacts of climate change in one of the hottest and driest regions of the world.

**Emily Elias:** I'm Emily Elias, director of the USDA Southwest climate hub, and I'm here with Fred Petok who works at the USDA in Rural Development. He is an energy technology and loan specialist and interested in technology values and climate. He's also a member of the national USDA Climate Hub Executive Committee, and the Southwest Climate Hub Stakeholder Advisory Committee, so I've known him for about five years now.

Our team at the Southwest hub developed a vision of resilient landscapes and resilient communities. And there are times when community resilience needs to be financially supported, but the business of financing climate adaptation is outside of my biophysical background and training. So to learn a little bit more about the business of financially supporting climate adaptation for communities, Sarah and I invited Fred to have a conversation about how the programs he administers can support rural communities in a changing climate.

Fred, thanks so much for taking the time to speak with us.

**Fred Petok:** You’re welcome.

**Sarah Leroy:** Thank you so much, Fred. I'm really excited to learn about rural, Rural Development. Um, as I'll be honest, my knowledge of the agency is pretty limited, so maybe you could just get us started by telling us a little bit about yourself and your work with RD. How long have you been with Rural Development and what area of the US do you cover?

**Fred Petok:** So I've been with Rural Development since 2007 and Rural Development is organized with a national office in the District of Columbia, which I'm attached to and live a little bit outside of the District, in Maryland. And we're also organized with state directors. So we cover 47 States from Republic of Palau to Puerto Rico, and the Puerto Rico office is shared with Florida, Maryland, and Delaware share an office. I think Hampshire and Vermont share offices, but we have breadth within each area.

So although the Arizona office, I think is based out of Phoenix, there are area offices in most States. We have at least 4,000 people and we work with other agencies in the USDA. Most of the programs that I work with come into the national office, because the loan guarantee amount is so much that it exceeds the state authority. Although there's been some relaxation of that, uh, with the, um, the circumstances that we're in, that certain authorities have been given to the states, but loans of a certain amount are going to come through the national office. And some programs. For instance, uh, I started off working on a program that is now eliminated. It was, um, A program that had to do with re powering facilities using biomass. And that program came through the national office, but the Biorefinery Assistance Program and Renewable Chemical and Biobased Products Program is run through the national office, although we work with state offices. Um, and, uh, that that is the one program that remains in the national office, along with the HBA program, which is a relatively new program. It's a hundred million dollar match grant to provide infrastructure incentives for biofuels. So it's going to work basic living with ethanol producers and bio diesel producers at the distribution end, and to get more biofuels accessible for Americans to consume.

**Emily Elias:** Fred, it sounds like most of the projects that you work on are some of the larger ones, um, ones that, uh, exceed that state authority. And we know that Rural Development provides funds to support rural communities. And this is critical for many services. But the direct link between your programs and weather and climate, isn't entirely obvious, at least not to me. So can you tell us about Rural Development mission and how that mission intersects with weather and climate?

**Fred Petok:** I'd be happy to. One of the weather related disasters that we intersect with, and of course we intersected with the rebuilding of uh Puerto Rico, uh, happened about the time I came to Rural Development. There was a very severe tornado, um, that had the highest rating of destructive capability that struck Greensburg, Kansas. And it just devastated the community, it basically obliterated 95% of the town. And a lot of federal aid and state aid came into that community to rebuild that. Rural Development through the Rural Energy for America program contributed about $2 million in grants, and those are matching grants so there's a participation that's matched with equity and then also with loans. But the Rural Energy for America program has become a program that is widely subscribed to, it's been permanently established within the code of the United States. And it's only dependent on funding now. So it's a permanent program. It's had a tremendous impact on rural communities and it's benefited them in two ways.

It's provided opportunities for energy efficiency, and it's provided opportunities for renewable energy development. Um, the program and many of our Rural Development programs work almost magically if you think about how money is multiplied. So basically what happens is, if you have a hundred million dollars that Congress gives you, then if the subsidy rate is around 4%, you really have a billion dollars. So the way that works is we're really just covering losses in our program. Now the HBA program works a little bit differently, but money comes from the CCC authority. So that's a special lending authority, and that also empowers the ability of the markets to leverage funds and put them out there.

As many of you are aware, ARS some of the science agencies work in a little different ways than the broader USDA community works. We work very much like a financial priming pump facility. So we're interested in Rural Developments portfolios, probably over 230 billion, which makes us sort of a mid-range bank, if you will. And the majority of that goes into housing, direct and indirect loans in single family and multifamily communities. We also support broadband wastewater treatment plants. We have a special authorities for community development. We have authorities for grants from evaluated producers. We have, of course the simple work for electrification, which has been part of the USDA for years. We've stayed absolutely away from coal. So we have innovative programs that commercialized things that haven't been done yet. Like making renewable chemicals, and making biofuels that are cellulosic in nature, or making bio-based products. So the idea is to bring the agricultural products and wastes that can't be used any other way into the value chain and create prosperity and jobs in rural America, and in other places sometimes because there's a spillover factor.

Uh, that's, that's basically what we do and it can have, and I think it does have a tremendous impact on communities. On, climate change, it certainly can be used for that to lower emissions and to transform economies so they can transition to cleaner ways of using products, closing the carbon level.

**Emily Elias:** Yeah, that's one of the areas of Rural Development I'm most interested in, is on the use of renewable energy. So I know that you support solar and wind, biogas, and those sorts of things. And I'd be curious about, um, some of your numbers for this year and last year, if you can tell us a little bit about that.

**Fred Petok:** Well, I put out some numbers for you. I think we had about 93 million in pipeline projects for solar, uh, this year. And I don't know how many of them will close, but we saw a couple years ago that, we, we started to grow the portfolio. As, um, the price of PV went down and efficiency went up, we started to see in the guaranteed loan portfolio, hundreds of millions of dollars in [inaudible] loans

**Emily Elias:** and PV? What's PV?

**Fred Petok:** That's photovoltaic.

**Emily Elias:** Okay, thanks.

**Fred Petok:** I mean, we do see small thermal, but we've had over 18,000 projects that have been done in REAP. And last year, I think we got about 1,300. So we're putting out, uh, you know, 60-some million dollars in grants and it's leveraging hundreds of millions of dollars in projects, and that does not include the guaranteed loan only portion.

So I wanted to just call up some information on, uh, on, basically biogas projects, because we kind of started this discussion about a biogas project in your area, which has about $29 million in total development costs. And it will actually save on a yearly basis, uh, about 27,000 metric tons of, million metric tons of emissions. So altogether, right now we've seen this tremendous growth in larger projects. We're working on a project and it's over $45 million. It's a cluster in California. We have a project with digesters and you can tell, I probably work quite heavily with digesters and with the EPA, ‘cause they're interested in methane emissions, but, uh, we have a project in Wisconsin that is, uh, $125 million basically in total development costs. And that is going to produce, it's in the area of, over five thousand million BTUs a year. So this is a big area where we've seen smaller digester projects in the past that were five or ten million dollars. Really what's happened here that has made this really dynamic is the California low carbon fuel standard, which is valued at 180, 190 a metric ton of carbon intensity credit.

And, that's been a big driver. It's really come up as opposed to the RIN, but you see D3 RIN and D5 RINs with biogas projects. What it's done is it's taken the digester project that was having a difficult time generating electricity, from $3 to $5, or $6 an MMBTU, and its produced revenue that in some cases is over a hundred dollars an MMBTU. It's very common to see projects getting $25, $65 so on. And there are a lot of people that are taking that slice, but if it's used for transportation in California, if it has got a documented pipeline. And it can also go now to Canada, and there are people who want to push it into electricity and there's some other markets besides California, out West. And there's talk about other, other markets as well, but that's been a huge driver for bio gas. And so we see a billion dollar opportunity now, not myself, but people who are much more knowledgeable than I am. And that that's an area where we've seen tremendous growth. And we're very happy about that because we've seen a lot of solar and it's been tremendous, but now we're trying to diversify that portfolio. So when it comes to our portfolio and risk management, we don't want all of our eggs in one basket.

**Emily Elias:** So that's really interesting. And just for our listeners, um, let's take a step back and talk a little bit about what biogases and anaerobic digestion and, and sort of this technology, I know you were talking about BTUs, British Thermal Units, a measurement of energy. So tell us a little bit about bio gas as a technology and diversifying into that.

**Fred Petok:** Well, biogas, uh, is not a new technology, it's used in Europe more extensively than America. Uh, it's used in India, and elsewhere and in smaller digesters. But in the United States, we haven't seen the tremendous growth that we feel we can see more of.

It's basically a thermophilic or mesophilic process where anaerobes, in an oxygen free environment, digest, then they have a dimensionless form of kinetic energy that expands along a parameter. It's constantly growing and decaying, and the result, it produces, from manure, it can produce methane from chicken manure under the right circumstances, dairy manure, even cattle manure can be used but the energy content could be less depending on the mix. And of course, swine manure be used.

So what it does is it produces a gas that is about 60%, can be a little lower, can be a little higher, methane content. I believe that’s CH4. Now that has to be upgraded to go into a pipeline. I used to work in another federal agency and they were very, very careful about the specs for their natural gas. And every company has a particular heat value that they're looking at it and it's going to change and so on and so forth. But you want a commodity that is very clean, and it can be delivered as a reliable econ [inaudible]. So biogas has to be upgraded basically to remove hydrogen sulfate and some other contaminants so that it can go into that pipeline.

There are also ways of transporting that through a virtual pipeline, which is physical, actually shipped in a container, a transport vehicle and then injected into a pipeline, or it can be used for heat, elsewhere. And it can be used to generate electricity through diesel generator, another more sophisticated form of combustion, like a micro-turbine [inaudible].

**Sarah Leroy:** So, yeah, thanks for that explanation, Fred. And um, thinking about these large, large scale projects that you've been discussing, you know, it seems that at Rural Development programs, you know, they cover adaptation through maybe sustainable rebuilding after extreme events. You know, you obviously do a lot of climate mitigation, right? Through supporting alternative energy sources. But obviously a lot of these projects are very large and very expensive. So do you have any advice for a community leader or organization? You know, who's interested in maybe starting a project?

**Fred Petok:** Well, let me just mention that of the 60-some million dollars in grants that we gave away last year, um, there's a set aside so that I believe roughly 20 million goes for grants of 20,000 or less.

And I worked on a small project today where somebody was converting, happened to be a gas, um, a pivot pump to an electric pivot pump and, you know, it had a very long payback, but there are a lot of factors that go into scoring and it seems like it'll score very well. We do a lot for people, who do small projects. So not every project that we do needs to be large. Some of the projects in 9003 are very large. And they're very challenging. And so communities can use grants and community facilities to do other things. They can get a firetruck, can do things that allow municipalities to borrow and get money, not all those projects are small. We can make improvements or help communities make improvements locally. We can help people who want to sell organic food. Uh, we can help food co-ops. We have a whole co-op division that has written the book on that. And we still monitor that, we’re, we’re not as engaged so much in that, but it's a very big part of our history and what we do. And our rural electric cooperatives are made up of cooperatives that span the United States, and they contribute a tremendous amount of electricity in lines, distribution and services to people. So they have borrowing capacity through that. But in terms of any community, rural or urban, that's interested in doing something small or large if it's commercially available, or if it's more challenging, we have programs that can help them use wastes, agricultural waste, possibly even municipal waste, and extract the value out of that to create jobs, to reduce pollution from those wastes and to, uh, serve their communities and hopefully turn a profit as well.

**Sarah Leroy:** That's great. So you have a very large range of availability it seems. Um, so if someone were interested in, you know, applying for funding or how would they find out more information on projects?

**Fred Petok:** So that's a, that's a great question. We have over a hundred programs that are administered through Rural Development, and the best way to start, is to start with the Rural Development office in your state. You can look at all of our programs online, but you can apply for most of those programs through the state office. And you will find that on our website, you, you can certainly get to the state programs, find the business directors in the state, the state director, find the people who work in utility programs, community facility programs, and so on the HBIIP program, the biorefinery program, we call it that, we call it 9003, Biorefinery Assistance and Renewable Chemical and Bio-based Product Program, that is administered through the national office.

**Emily Elias:** Excellent, thanks. Um, and I was just looking up your website, which looks like rd.usda.gov. So go there and you'll be able to find a bit more about those programs. Fred over time, you've told me some stories about different projects and different locations. And I'm curious, especially related to, um, climate adaptation. And I'm curious about, um, if there are any that stand out that you want to tell us about any projects that, um, you'd like to share.

**Fred Petok:** Well, I'm particularly involved with the efforts to build resiliency and scale with, uh, anaerobic digesters. We've had some, um, circumstances where things haven't gone well. And so we've tried to learn from that. And as it turns out, some of the work that NRCS has done would have been very instructive. But, uh, we think that we've made a lot of progress and have some really good people on our team. Some of them are outside of USDA, but a lot of the resources that we have within USDA, NRCS, and within our broad team of Rural Development and business programs.

And what I've learned is that the team approach in our executive committee is, is very good at that, in vetting those projects. And we've seen growth in, uh, renewable diesel. Um, we've seen a lot of growth in biogas and I think we're going to see some growth in renewable chemicals, basically biobased products and so on, that are going to come online. A lot of these things take time to develop, but the, the nice thing about what we do when we work as a team is we build jobs in rural communities. Sometimes we keep populations in places because we're using products that didn't have a purpose before. And I think one of the stories that, you know, I'm not, um, solely responsible for, but RD is in part, is the soy producers who, as they grew more and more soy, they had a problem with oil and they basically grew the biodiesel industry out of that. Now they're trying to grow other uses for that, but I think you can see the same thing with dairy and cattle manure. Cattle is going to be a little more chair-up challenging to make new products to reduce, the, uh, a the leachate, the run-off, the ground water contamination, to produce biogas. And I think it's a very good thing. The American Biogas Council, I believe has said that, you know, if we can just put 20%, or even less, of biogas into the gas pipelines, natural gas, which is touted as being one of the cleanest fuels, would be carbon-negative. So I'd love to test that out. Sounds too good to be true, but a lot of these things really are.

**Emily Elias:** And you also mentioned just briefly bio-based products, which is different than biogas, but you're referring to products that are derived from plants and other renewable materials, um, as an alternative to conventional petroleum direct products. So those include things like detergents and fertilizers, fertilizers, and bio-plastics, so this is a really huge program that touches many different industries and products as well. Did you want to talk any more about your bio, bio-based products?

**Fred Petok:** Yes, I, I do thank you for the heads-up on that. Kate Lewis, who heads up our BioPreferred Program, that was a program that was at departmental management, and Ron Buckhalt did a lot of work with that. That's a great program. It's a voluntary partnership and it has, I think, over 3000 participants and it really has two components. One is a procurement provision that directs federal agencies to buy BioPreferred products. That's a challenge, because those of us in the procurement agency have to comply with a lot of acquisition rules, but it's also a voluntary partnership that promotes the use of all these products that are cross-cutting. Some are developed by large companies that you would know on the marketplace when you go to buy detergent, others are not well known. One that we work with especially was, uh, involved in the 9003 program, and we were going to close that particular loan and, something happened with the equity and so on, but they make a synthetic motor oil, which works in high compression vehicles and it's made out of plants. So these types of products, they are great solutions. And, uh, recently I was looking for dish soap and I happened to find some that was in that program and I grabbed it, cause it was the only thing available, but they range in, uh, in scope with a lot of different products. And although there's no financial direct support that RD does provide, it doesn't mean that these companies couldn't use our B&I industry loans or other types of loans or grants that we might have, if they're eligible, to, uh, finance their operations, uh, or gain loan guarantees in that sense. So the BioPreferred Program is something that we hope that more federal agencies will choose as a procurement choice because it's better and cleaner for the environment, it supports the communities in which these products are grown, and in many cases where they are transformed into products, and they're better for the environment, a lot of these products, they're biodegradable and that's, that's a really important thing. They don't stick around in a landfill. They don't gum up problems with our water and sewer systems, and, uh, they're just easier to process and better for planet's health.

**Emily Elias:** So as a consumer, when I go to the grocery store to buy groceries for my family, would I be able to, to see, is there a system or a labeling system.

**Fred Petok:** There is. And I know that sometimes you'll see a USDA Organic, that's a branding system, but there's also a label on there that says USDA BioPreferred, and it's a voluntary program, but you'll see that. And it's, it's, it's a really nice thing. It's like seeing, uh, if you're a meat-eater, a USDA, a certain grade of beef, and that means something to a lot of people. So it's marketing, but you know the story behind it.

**Emily Elias:** Excellent. I'll look out for that. That's great to know. So circling back, um, we've talked a little bit about the bioproducts. What about anaerobic digesters? You mentioned those before. I'd like to touch on that again, because that seems like a really important technology related to both methane and carbon dioxide emissions. And I know that you've mentioned to me in the past a specific project, um, called the Sedona project. I don't know if you want to expand on that or digesters more broadly.

**Fred Petok:** Well, uh, the, uh, project that you've mentioned is one, I think that I became attached to, and it's not necessarily that particular project, but I remember once I was out in El Paso and I drove up to Las Cruces and you just see miles of sand storms, uh, but sometimes you also see miles of cattle. So with a cattle lot, uh, if the, uh, manure is not scraped, from, uh, a, a dirt floor, if it's on cement, doesn't have any rocks in it, and you add food waste to it or water, you'll get enough of an energy content. If you put sand or rocks in a digester it doesn't, doesn't digest well, won't digest at all. So digesters will work with grain. They will work with manure from swine. They can work with chicken litter if you use a flotation system and you separate and process the manure, and you remove certain attributes that are attached to the litter, and they certainly will work pretty well with dairy manure. We've seen in the past some food waste that's mixed with it, and that boosts the content. We can do digesters with, uh, streams of brewery, uh, waste, uh, and so on. You know, we also see, uh, there, there are projects that, you know, use wood and gasification and a methagination process, uh, to, to produce gas as well. But that's something that we see in the, uh, in the 9003 programs. So. There have been a few studies that would say that the United States could support 8,000, even 300,000 digesters. You can see low-level streams of, uh, of, uh, gas coming off of wastewater treatment plants. Some of the larger plants have done that, but you can also see processing of sludge into other bio-based products. And, uh, there's, there's a tremendous growth opportunity, for, uh, expanding the amount of biogas that we produce.

**Emily Elias:** Excellent. That's really interesting in terms of both of mitigation, but also, um, waste management and the other environmental impacts of waste. So, um, Sarah, did you have any last questions for Fred?

**Sarah Leroy:** I don't think so. I've kind of just been digesting every, like I said, I'm, Rural Development is a new agency for me and I, I really am just soaking it all in all the different projects that you work on.

I will say that, um, Emile had mentioned to me some work that Rural Development had done in the area of biochar. And I thought that that might be interesting to some of our stakeholders and, you know, the idea of using recoverable forest residue and sequestering carbon in the soil. Um, so maybe you could elaborate a little bit on those types of projects and, you know, explain biochar and how you work with it.

**Fred Petok:** So biochar is a product that has been around USDA for much longer than I've been there. Uh, there's been a lot of interest in it. Some companies have wanted to use a biochar product that has come from coconut shells, ah, macadamia nut shells perhaps, and then using those in activated carbon and batteries. But that, that never happened for us, it may have happened for the company. Uh, other companies have seen a lot of value in it and some have wanted to produce a very high quality, tensile strength, nano material. That, uh, is basically, uh, you know, nano-structured carbon that they claim that they can produce at a very inexpensive rate and that has a lot of potential, but we haven't seen that come through our pipeline.

What we have seen in the limited number of applications that have come to us is that the value stream in the biochar products has not been translated beyond market studies into offtake agreements. So in certain programs, in fact, for all of our programs, but particularly in the 9003 program, we have to look at the source of the feedstock, the credibility of that feedstock, the credit quality of the companies that are supplying it, and also the off-take for it. So. It has to be very real. Our 9003 program, it goes through a number of processes, including an individualized subsidy rate through the office of management and budget. So they take a hundred million dollars and say, you know, it's, it's not necessarily 10% subsidy rate. Which, you know, would be a billion, but you know, it could be 30% on this particular project or it could be higher, so it's difficult, but these are challenging projects that want to take ah, wood and make a jet fuel, for instance, out of it. And although it can be done, building a plant to do that, getting the performance guarantees, liquidated damages, all the things that go into a delivery of technology and vetting the technology there, they're pretty difficult to do.

**Sarah Leroy:** So, I guess I have, uh, sorry, just one more question. Um, so we've talked a lot about mitigation and alternative fuels and such. Do you have any projects that you fund that are kind of preparing for climate impacts? You know, so if a region knows what’s coming, you know, in the next 20 or 30 years, and they want to kind of prepare for those impacts. Are there any projects related to that?

**Fred Petok:** So what we really do is we facilitate others’ vision. And we do grants and financial guarantees for that. So if somebody were to say, based on a climate study, that might involve one of the Hubs, “We need more resiliency.” “We need to plant this crop.” “We need to shift to this.”

We might be able to help with that. Or the Farm Service Agency might be able to help with that. Or if you wanted to build a housing that met a certain standard, we might be able to help with that, but the people who are proposing those projects would have to be the drivers of it. And so that is, is the way to approach that. It's really taking the vision of individual entrepreneurs and communities, and electric cooperatives, and people who are doing broadband, and building wastewater sewer treatment plants, and building communities who are investing in communities and businesses, it’s trying to take their vision and translate it. So when you're doing a 10, 15, 20 year loan, you certainly can do that. We can be a part of that.

**Emily Elias:** And that makes me think of, um, one of the first examples that you mentioned of the tornado in Kansas and how that community chose to develop and rebuild and in a sustainable way that you helped support.

**Fred Petok:** Yeah, they, they wanted to use LEED and we could certainly support that. And the other thing that I would say is that our programs come from the authority of Congress. They come from crafted legislation. We have to interpret what is the way to do that into our regulations. But Congress is the one that came up with the Rural Energy for America program. They had a vision. We just became the, uh, facility that, uh, other people could, could use to do that.

And that's the same with the, the BAP program, the Biorefinery Assistance, Renewable Chemical Biobased Product Program. That's a congressional program, that's supported by Congress, that is basically saying we need to make investments in new ways of doing business. Part of it is being able to sustain agricultural communities as we have always done to try to find value and new products. Part of that was a reaction to trying to find ways to have energy independence with new fuels. Part of it was a way not to use so much corn ethanol, but to use cellulosic ethanol. And much of, it was basically a glide path from the bridge to the hydrogen economy, if you will. And that was supposed to be biomass. It is biomass to some degree, but it's also been largely solar, and that's been a very big part of what we've done. I would say our solar loans have been small. They've been small in comparison to the department of energy's loans. And I don't want to take anything away from them, but the last time they made a guaranteed loan in their program was for Solyndra. They have had some very large loans for automotive companies and they've been repaid, but they're not doing what USDA does. So what USDA does, what Rural Development does and what the other agencies at USDA have done is really, really tremendous work. And we've got a great group of people. I'm lucky to have been able to work with them, to participate with them, to learn with them and to work with the people in the lending community, which are true- they're really our clients to a great degree. They, uh, they make money out of it. That's true, but they're supporting entrepreneurs and we work with them and we work with people who have an interest in doing renewable energy and energy efficiency, to, uh, to make a difference in rural America and for all of America.

**Emily Elias:** Thank you so much. And my one last question for you, this is an easy one, I promise. You've mentioned several times throughout our conversation, the 9003 program? I want to make sure our listeners know what that is.

**Fred Petok:** Okay. That's the Biorefinery Assistance, Renewable Chemical and Biobased Product Program. It is a program that is basically to commercialize the development of advanced biofuels, renewable chemicals, and biobased products with technologies that are not commercially available for the most part, they're innovative. And some of the projects that are extremely innovative.

**Emily Elias:** Excellent. I look forward to hearing more about your successes with this innovation as it keeps going forward. Thank you so much for joining Sarah and I on Come Rain or Shine. There seemed to be a lot of opportunities to support all sorts of things from smaller scale solar to anaerobic digesters, alternative energy, rebuilding after extreme events. So many of our listeners probably didn't know, or have a deep understanding of what you offer, so thanks so much for talking with us today.

**Fred Petok:** Thank you.

**Sarah Leroy:** Thank you so much, Fred. It was great to meet you.

**Fred Petok:** Nice to meet you, Sarah.

**Emile Elias:** Thanks for listening to Come rain or Shine podcast of the USDA Southwest climate hub **Sarah LeRoy:** and the DOI Southwest Climate Adaptation Science Center. If you liked this podcast, don't forget to subscribe, like, or follow for more great episodes. If you want more information, have any questions for the speakers or would like to offer feedback, please visit, climatehubs.usda.gov or swcasc.arizona.edu.

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