

Dr. Chief: Our final graduate that we want to celebrate and acknowledge is Dr. Rebekah Waller. So, Rebekah - Bekah as we call her - just actually defended two days ago, and so I was proud to be on her committee as a PhD minor, and she received her PhD in Agricultural Biosystems Engineering. And I know a little bit about her personal story, but I would like to have her advisor share that because he's here with us today. Thank you so much Dr. Kacira for joining us today, and we'd like you to share about Bekah with the viewers out there and for our group. Thank you. Dr. Kacira: That will be a pleasure. Thank you. Thank you Karletta, I really appreciate it. Hello everyone, it's so nice to see you here in person, not on the Zoom. And thank you Dr. Chief and Cara as well as Torran for arranging this event for us and for our graduate students to be together and celebrate their achievements. I just want to say that IndigeFEWSS project is one of the most exciting projects that I have been involved in my academic career because of the objective it has, because of the impact - expected impact it has with the - for the communities that you're working with. Also the educational opportunities that it's providing to our students, and also our faculty, us, you know, the learning and rewarding experiences that we are enjoying, so I feel very fortunate for that. Congratulations to our graduates Manuelito, Adrianna and also my student Rebekah. It's been a challenging year; it took a lot of effort on your side, a lot of challenges that you had to deal with, but also your families, your friends around you committed to your success, so congratulations to them as well, as well as congratulations to you. And we are proud of all the students we have in the cohort.

Rebekah's research really focused on the evaluation of organic photovoltaic films for greenhouse systems integration. So, our interest with that technology is because of its ability to tune the spectrum, the light quality, for plant production and also with energy production capabilities. It's a new technology, not like the traditional silicon photovoltaic systems that we know of. It's not commercially ready for greenhouse systems integration, but it brings a lot of opportunities. So, that's what her interest was, so she constructed an experiment and research with a pilot study that developed a methodology to evaluate solar radiation availability on a greenhouse roof on a point by point basis on a tilted surface, so you can consider that for the performance of the organic photovoltaic films for power generation. And that methodology can be translated or scaled up to any other types of structures like greenhouses or other types of agriculture production systems, so that's very unique.

Another part of her research work evaluated the shading element, PV used as a shading element, as well as power generating technology for crop production, and evaluated how the crop was actually responding to that environment created under the photovoltaic system integration at scale, which was a greenhouse. And the literature does not have such information, so it is unique in a sense that we were - she was able to generate meaningful information for those who are interested in learning about what are the capabilities, but also on the other hand what are the limitations of this technology and what needs to be improved. So, the last part of her dissertation focused on an analytical study that suggests - makes recommendations in terms of this technology integration at the cell scale, the module scale, at the system scale, at the regional scale and what the researchers should pay attention to or consider, or maybe also the manufacturers should keep - should consider in terms of the manufacturing as well as offering this technology. So, I felt really again - once again - fortunate to work with a student in her caliber and it was pleasure working with you, Rebekah, during your graduate program. I hope that it was

as fruitful as it was for me and educational and you had some good experiences, not only working in our lab, but also working with your friends and with your fellow friends as well as other faculty members. So, with that I feel that - I feel very confident that her future is bright and wherever she will be, she will be a star again on the works that she is doing and performing, and hopefully we'll be in touch in class. So, congratulations again, and thanks to Dr. Chief for your leadership for our students and Cara and also Torran; I think your support was instrumental for their success as well. Thank you. Dr. Chief: Okay Rebekah, so come up here and we're doing a round table, so I'm going to ask you some questions as well - very similar to Manuelito's. So, Dr. Waller! Wow, that's amazing! How do you feel now that you have the doctor title? Dr. Waller: Same. Yeah, but special, special experience. I wanted it to be in person - the defense, but pandemic circumstances it was virtual and still, you know, was a successful event experience, so yeah, it was good. Dr. Chief: Great. Well, could you tell us a little bit more about how it was for you being a trainee in IndigeFEWSS and what kinds of things did you participate in and how did that impact your education towards your PhD? Dr. Waller: Yeah, hearing Manuelito talk about the importance of just the transdisciplinary opportunities that are available within IndigeFEWSS. I guess my - I'll start with my undergraduate experience was quite transdisciplinary, although wasn't STEM-related explicitly. I studied International Relations and Arabic and Environmental Science when I was an undergrad, so I was already dabbling in a lot of things, and coming into graduate school and hearing about this IndigeFEWSS opportunity from Dr. Kacira offering a lot of transdisciplinary research collaboration, that made a lot of sense to me coming from like a multi-disciplinary undergraduate education. So, it was very easy to convince me that this was something that I wanted to do and it, you know, didn't disappoint. I had so many opportunities to work with water people, PV people, materials people in meaningful ways, both like hands-on projects, outreach in Navajo Nation as well as research projects, and I think you really have to talk to a person - to a grad student who's not in IndigeFEWSS or a program like IndigeFEWSS in order to realize how rare of an organization and collaboration - collaborative environment this is, and yeah, for you to appreciate all of the opportunities IndigeFEWSS brings to its trainees and the people involved in the program. Dr. Chief: So, you are actually one of the trainees that went on the spring break immersion trip to the Navajo Nation and you stayed in a hogan and slept on the floor. Could you talk about your experience there, and was it new for - I know you also traveled around the world to other developing communities, but could you share about that experience and how it impacted you and maybe some things you learned from that? Dr. Waller: I'm from - I was born and raised in Tucson, so Arizona is my home state, and like you said I've traveled to other countries in which communities are also resource-limited and I saw that. But seeing it here in Arizona was an entirely unexpected experience and I think that's both my fault for not being aware earlier, but also just it's not advertised I guess unless you're directly related to issues going on in communities like Navajo Nation in which you are challenged by access to food, energy, water infrastructure. So, the immersion experience was actually my second trip to Navajo Nation after our TCUP 2018 program, which was super eye opening, and then the immersion experience having the opportunity to sit down and talk to community members in more I think authentic ways, and getting the opportunity to stay with Nikki's family. We'll forever be appreciative of that, you sharing them with us. It was really an immersion experience and came away with a new understanding of issues that residents of Navajo Nation and similar communities face in just living their normal daily lives, and it really makes you appreciate as a STEM person working in food, energy, water - really makes you appreciate your work and want it to have a bigger impact for people living in those situations. So yeah, very, very special experience and I'm appreciative for everyone who hosted us while we were there. Dr. Chief: Could you explain where you

slept and the hogan? Describe the hogan? Dr. Waller: I think I was in between Karletta and Michael in a sleeping bag, spread out, but yeah I think that was not the most comfortable night of sleep. Yeah, I don't think I slept, actually.

So, Nikki's nana is definitely - kudos to her for

living in those circumstances - by her own choice I think. But still, it was a completely novel home experience. I hope to have it again someday. And yeah, again, it just makes you appreciate the resources that I have access to very conveniently, but also appreciate another way of life in which they, you know, have been living that way for many, many, many years and it's beautiful, yeah, to witness and to be a part of. Dr. Chief: So, I know that in your project that you did for CHEE 514 that the hogan, which if those of you who don't know, the hogan is a traditional dwelling on the Navajo Nation. It has eight sides and it typically has a log frame that has insulation with mud. And anyways, that structure influenced your project in designing the greenhouse. Could you talk a little bit about that? Dr. Waller: Yeah. I worked with Michael and Nikki. Did we have one more on that team or was it just us three? Michael: Karletta? Dr. Waller: She was on the other one I think.

right? Us three put our brains together and looked at the - we were tasked with creating a culturally relevant food, energy, water integrated system for siting on Navajo Nation and decided that a school would be a great site location in which you could build a system that demonstrated the capacity of integrated food, energy, water technologies to, you know, co-located food production, electricity production, and not necessarily water. But anyway, we designed this cool hogan greenhouse, the solar hogan teaching greenhouse inspired by the architecture of the hogan, and used that in a passive solar greenhouse design with a transparent glazing on the southern hemisphere of the hogan, and then an insulated northern wall, which, you know, we'll have to build it actually in order to see how it would perform, but the hogan I thought translated really well into a conventional greenhouse design. And it also was metaphorical being able to use a feature of Navajo culture in a new food, energy, water technological solution to address challenges, you know, in resource access there. And so, we developed this system, developed kind of a curriculum that they could use to teach students about how to grow crops in different hydroponics or soil based systems within the hogan teaching greenhouse, we integrated PV into the system and then presented this design idea to the Indigenous Tribal Education program and got very positive feedback from everyone, which was not unexpected because as like through all my experiences in Navajo Nation, people are just so interested in coming up with new ways to solve resource access issues there. So yeah, good reception and just continued on the theme of Navajo Nation residents, community members being really excited about FEWS solutions. Dr. Chief: Well, I think that project I hope will continue on and maybe come to fruition through Dr. Kacira's work, so thank you for your contributions on that. And one of the things I remember about you being a trainee is how well your teaching skills and your communication science skills are excellent. So, Bekah did a training for the Intertribal Environmental Professionals on greenhouses and she also really has a real approachable way about her in connecting with tribal college students, so she led the hands-on activity in the greenhouse and those are very memorable for me, so thank you for all your hard work in

IndigeFEWSS. So what's next for you? Dr. Waller: Largely to be determined. I have - yeah, I mentioned this in the review that we did with Jen last week. I was offered a position in Saudi Arabia at this Center for Desert Agriculture similar to the Controlled Environment Agriculture Center here in Tucson - or similar goals - but throughout that interview process it's clear that they're not just wanting a researcher, a greenhouse researcher, they're wanting someone who has skills and expertise in a lot of different things and also a person who can talk to people and go out into the community and do, you know, like hands-on outreach programs for students and community members. And I mentioned IndigeFEWSS throughout my application process as an example of a multicultural community outreach teaching experience that I was able to have in grad school and could translate well into the requirements for that position. So, IndigeFEWSS is very, you know, beneficial in the interview process. But yeah, TBD, still surveying my options and we'll see what happens. Dr. Chief: Wow, that's exciting! Well, it looks like a bright future for you in anything that you choose. Dr. Waller: Thank you. Dr. Chief: So, we wish you all the best and thank you so much and congratulations. Enjoy the commencement and all the activities with your family. Congratulations Dr. Waller!