

FEARLESS



A TEXAS TECH PRODUCTION

Season 2 | Bonus | Level Up

(Driving sounds)

(Music)

DRIVE ANYWHERE IN THIS AREA AND YOU'LL SEE THAT WEST TEXAS IS IN BLOOM. FOR MILES IN EVERY DIRECTION, FIELDS ARE OVERFLOWING WITH PUFFY WHITE BOLLS OF COTTON. RECENT DROUGHTS HAVE DELAYED THIS PROCESS A BIT IN SOME AREAS, BUT IN OTHERS... IT'S AS FULL AND PURE AS EVER.

BUT NOT FOR MUCH LONGER... THE CROP IS RIPE. AND SOON, IT WILL BE STRIPPED FROM FIELDS AND SENT OFF FOR THE NEXT STAGE OF ITS LIFE.

SEE, OUT HERE, FARMING IS MORE THAN A LIFESTYLE. IT'S A LEGACY. ITS FAMILIES FOR GENERATIONS POURING OUT THEIR SOULS IN THIS SPACE.

BEING A FARMER IS TOUGH... IT'S GRITTY, DIFFICULT, HARD WORK THAT'S ALMOST ALWAYS UNCERTAIN... IN SOME WAYS FARMING TODAY IS HARDER THAN EVER BEFORE. BUT RECENT ADVANCEMENTS IN TECHNOLOGY AND SCIENCE ARE HOPING TO CURB THOSE CHALLENGES FOR THE FARMERS OUR SOCIETY RELIES ON.

(Tractor transition to scrolling and clicking)

I'D LIKE TO TAKE YOU BACK TO FOUR YEARS AGO, A SCIENTIST AND PROFESSOR IN OHIO IS READING THROUGH A JOB DESCRIPTION ONLINE. IT'S FOR THE CHEMICAL ENGINEERING CHAIR IN THE COLLEGE OF ENGINEERING AT TEXAS TECH... AND IT'S CRAZY... BUT SHE FEELS IN HER GUT THAT THIS POSITION WAS CREATED FOR HER. IT'S LIKE THE DESCRIPTION WAS *DESCRIBING*HER. IT WASN'T JUST THE FIELD OF STUDY SHE WAS ALREADY THRIVING IN, THIS POSITION WAS IN AN AGRICULTURE REGION THAT WOULD TAKE HER RESEARCH TO THE NEXT LEVEL... OR BETTER YET, TO THE VERY TOP. AND THE DAY SHE ACCEPTED THE POSITION, IT WOULD BE THE BEGINNING OF A HISTORIC JOURNEY. FOR HER, FOR THIS UNIVERSITY.

(Music close)

(Crowded room)

IT'S OCTOBER 18TH 2022, UNIVERSITY PRESIDENT LAWRENCE SCHOVANEC IS STANDING AT A PODIUM BEFORE A ROOM FILLED WITH PEOPLE INSIDE THE STUDENT UNION BUILDING... BEHIND HIM, A LARGE VIDEO WALL DISPLAYS IN BIG RED AND BLACK WORDS- STATE OF THE UNIVERSITY. PEOPLE HAVE SHOWED UP TO LISTEN TO THE PRESIDENT GIVE THESE YEARLY REMARKS.

(State of the University)

Schovanec: Good morning, and thank you for joining us today...

HE WILL COVER THINGS LIKE ENROLLMENT, NEW FAULTY, RECENT GROWTH WITHIN THE UNIVERSITY AND STUDENT SUCCESS.

Schovanec: We must always keep at the forefront that we are here because of our students. More specifically, to educate and empower a more diverse student body.

HIS PRESENTATION CONTINUES AS HE TALKS ABOUT THE RECORD YEARS FOR BOTH ADVANCEMENT AND RESEARCH.

Schovanec: Another milestone was reached in August when the National Science Foundation awarded Texas Tech the largest grant in our history.

(Music)

THAT GRANT WAS GIVEN TO CREATE A FACILITY ON CAMPUS CALLED CASFER- IT STANDS FOR THE CENTER FOR ADVANCING SUSTAINABLE AND DISTRIBUTED FERTILIZER PRODUCTION.

(Office sounds, Schovanec SOTU)

SITTING IN HER OFFICE ACROSS CAMPUS, IN A WHITE LEATHER OFFICE CHAIR WITH THE CASFER LOGO PRINTED ON THE HEADREST, FORMER CHEMICAL ENGINEERING CHAIR AND CURRENT DIRECTOR OF CASFER GERRI BOTTE WAS STREAMING THE EVENT... LISTENING TO THOSE WORDS FROM THE UNIVERSITY PRESIDENT.

GERRI HAS SPENT YEARS FORMULATING THE PLAN LAWRENCE SCHOVANEC JUST RECOGNIZED IN HIS SPEECH. SHE BUILT CASFER TO BE A BRIDGE, CONNECTING MORE THAN 40 OF THE MOST BRILLIANT MINDS IN THEIR FIELD TO LUBBOCK TEXAS.

TODAY, WE DIG IN TO SHARE HOW THIS WORK COULD BE REVOLUTIONARY IN CREATING CHEAPER, CLEANER, MORE SUSTAINABLE FERTILIZER PRODUCTION.

WE TALK ABOUT HOW EXPANSIVE AND COMPLEX THE IMPACT WILL BE IN THIS BONUS EPISODE OF FEARLESS- WE'RE CALLING IT LEVEL UP.

(Music close)

THE CASFER GRANT, WORTH A TOTAL OF 51 MILLION DOLLARS, HAS CAPTURED THE ATTENTION OF SCIENTISTS, RESEARCHERS, FARMERS AND STATE OFFICIALS, WHO WE'RE ABOUT TO HEAR FROM INSIDE A ROOM IN THE MADDOX ENGINEERING RESEARCH CENTER... OR THE MERC, WHICH WILL SOON BE THE HOME OF CASFER. ONE WEEK AFTER THE STATE OF THE UNIVERSITY ADDRESS, TEXAS TECH WELCOMED GOVERNOR GREG ABBOTT TO CAMPUS TO CELEBRATE CASFER.

(Room gets quiet. Door opens)

Governor Abbott: I like your tie...

EMERGING FROM THE DOOR AFTER HIM ARE LAWRENCE SCHOVANEC AND GERRI BOTTE.

Schovanec: Please be seated... we are very pleased to have you here today as we celebrate the National Science Foundation award that made possible the Center for Distributed Fertilizer Production...

(Music)

BEFORE WE GET KNEE DEEP IN CASFER- IF YOU HAVEN'T LISTENED TO EPISODE TWO OF THIS SEASON, EARTH, WIND AND WATER... DO IT. THEN COME BACK HERE. BECAUSE I PROMISE YOU, IT'LL MAKE MORE SENSE.

GERRI IS THE BRAINS BEHIND IT ALL. SHE HAS BUILT A TEAM OF TOP RESEARCHERS FROM TEXAS TECH AND PARTNER INSTITUTIONS- MIT, CASE WESTERN RESERVE, FLORIDA A&M AND GEORGIA TECH.

Botte: Today we spend a lot of money and resources making this nitrogen produced fertilizer. And not only that, we spend at least 7 times more trying to remove it from waste. CASFER is going to change all of that, we are going to use the nitrogen from waste to enable food production. One of the things that is important is the affordable and sustainable nitrogen fertilizer production for US farmers. As you pointed out, they spend \$21 billion annually in cost of fertilizer. So CASFER engineer system is going to stop that because we are going to deliver a fertilizer cost to the farmers that is affordable, sustainable and will not rely on those externalities. This is a fantastic opportunity to lead the world and change agriculture for generations to come.

(Applause)

Schovanec: I think you get a sense of Dr. Botte's passion... Thank you Gerri.

(Laughter)

HER JOURNEY DEVELOPING CASFER AND DISCOVERING HOW TO CREATE A NITROGEN CIRCULAR ECONOMY STARTED YEARS AGO... SHE HAS CONTINUED TO CULTIVATE THE PLAN, MADE CHANGES, TRIM THE FAT, SOUGHT OUT PEOPLE WHO WILL MAKE THIS PROJECT BETTER, BOLDER, BIGGER.

AND WHEN I SAY BIG, I MEAN... 51 MILLION DOLLARS BIG. 26 MILLION DOLLARS IN THE FIRST FIVE YEARS, WITH A CHANCE FOR ANOTHER 25 MILLION AFTER THAT. NEEDLESS TO SAY, IT REQUIRES A LOT OF STAFF- BOTH ON CAMPUS AND BEYOND.

(Skype sounds)

(Overlapping 'Hello... Hi, how are you? This is Yuri Roman.')

SO, WE CALLED SOME OF THEM...

Allen Ramsey: Thanks for giving us a call back.

THAT'S MY COLLEAGUE, ALLEN RAMSEY. HE'S A WRITER IN MY OFFICE. OVER THE LAST YEAR, HE HAS BEEN IMMERSSED IN THE DEVELOPING STORY THAT IS CASFER.

Ramsey: Trying to just get my bearings on what everybody is doing, I see you're the Thrust Three lead on this...

WE HAVE EACH SPENT MONTHS POURING OVER THE CASFER PROPOSAL, HAVING CONVERSATIONS WITH SCIENTISTS AND RESEARCHERS, TRYING TO FIGURE OUT WHAT WORDS LIKE ELECTROCATALYSIS, AND MULTIVARIABLE DYNAMIC MODELING MEAN... I KNOW, RIGHT?... HOPING TO UNDERSTAND SO I COULD EXPLAIN WHAT CASFER IS, WHAT IT WILL DO AND WHO IT WILL IMPACT.

Taylor to Yuri Roman: If you were to explain to someone who didn't know anything about CASFER in one sentence, what its purpose is, how would you do that?

(Music open)

Kayleigh Millerick: Let me take a stab at your one-sentence.

Amy Hardberger: It is hard to do.

Roger French: Affectively overall... what we are doing in CASFER is saying that we want to make a nitrogen circular economy.

Roman: The idea, then in very short, would be to move away from a linear production of fertilizers to a more circular use of fertilizers.

Hargberger: Usually I start by explaining how we do things now very briefly, somebody manufactures fertilizer, often with non-natural products, and then they sell it to a farmer.

French: ...Farmers put fertilizer on their fields, so the plants grow, but about half of the fertilizer ends up run off into streams. Therefore, it goes into streams and then it goes down into lakes and nitrogen and phosphorus excess in streams and lakes.

Millerick: But CASFER is also much more than just making fertilizer. It's making a system,

Roman: Oh, absolutely. I think I'd have to give all the credit here to Gerri.

THAT'S YURIY ROMAN- HE'S FROM MIT.

Roman: I think we can think about it from the national level, like how to think about re-imagining agriculture, giving farmers a little bit better control over the supply of fertilizers and how you deploy it and reducing the costs for that to actually develop fertilizers that are perhaps a little bit cheaper and that you can have more control or it's not a centralized as it is right now.

SPEAKING WITH RESEARCHERS FROM THE FOUR PARTNER INSTITUTIONS- IT WAS A REALLY IMPORTANT STEP FOR US IN SHARING THE CASFER STORY. GERRI HAS SPENT YEARS HAND PICKING THE MOST QUALIFIED, INTELLIGENT, PIONEERING RESEARCHERS IN THEIR FIELD AND THE TEAM SHE HAS PUT TOGETHER... IT'S NOTHING SHORT OF NEXT-LEVEL. I MEAN... THIS IS THE ALL STAR CAST.

Gerri Botte: I think the energy that you are seeing from the people who you have been interviewing... it tells you why we had the right people on board.

Botte: Another demonstration of when you have the right partners, they bring the best to the team. We were very excited. We put this planning grant together and we won it.

SHE SAYS THAT SHE REMEMBERS GETTING THE CALL THAT THEY HAD RECEIVED THAT PLANNING GRANT BACK IN 2018- IT SENT CASFER IN MOTION, GAVE IT THE INITIAL FUNDING NEEDED TO GET OFF THE GROUND. ANYWAY, SHE WAS IN THE AIRPORT.

Botte: and I come out of my stop in the airport in London, Heathrow Airport. I turn on my Wi-Fi for the first time after that all day long trip. I said, "Oh my God, [LAUGHTER] we have the planning grant."

AMONG THE FIRST PEOPLE ADDED WAS ROGER FRENCH FROM CASE WESTERN RESERVE. IT'S LOCATED IN CLEVELAND... A BIT OF A DIFFERENT LANDSCAPE FROM WEST TEXAS. BUT AS ROGER EXPLAINS IT, THE NEED FOR THIS KIND OF RESEARCH HAS BECOME IMPERITIVE OVER THE LAST FEW DECADES.

French: Toledo has a watershed, runoff in the Northern Ohio watershed into Lake Erie leads to a lot of nitrogen, phosphorous in Lake Erie. Then in summertime, usually in August, we can get harmful algal blooms that shut down all the drinking water for the city of Toledo.

(TV sound effect)

TV Reporter: Contaminated because of this Algae bloom in Lake Erie, so large it can be seen from space. The bloom turning the lake green is caused by farms and livestock pens...

8 YEARS AGO, THE CITY OF TOLEDO WENT DAYS WITHOUT WATER... NEARLY HALF A MILLION PEOPLE WERE IMPACTED. THE CITY DRAWS DRINKING WATER FROM LAKE ERIE AND THE POLLUTED WATER THREATENED THAT BASIC NECESSITY. THERE WERE LINES AT GROCERY STORES WITH HUNDREDS, EVEN THOUSANDS OF PEOPLE TRYING TO GET ACCESS TO BOTTLED WATER. IT WAS A MESS.

French: Amy Harberger is another person who's adjacent, an environmental lawyer at Texas Tech. She's part of this work right here what we need to do is think about what are the federal environmental laws? What are the state laws?

Hardberger: My name is Amy Hardberger. I'm a professor at Texas Tech Law School... (FADE)

AMY IS ALSO THE DIRECTOR OF THE CENTER FOR LAW AND POLICY.

Hardberger: So, the first thing I did, for example was I created a spreadsheet that had a section for CAFOs and a section for wastewater treatment plants...

WHEN SHE SAYS CAFOS- IT STANDS FOR CONCENTRATED ANIMAL FEEDING OPERATIONS. THIS IS AN INTERSECTION FOR ROGER AND AMY- CAFOS ARE ONE OF THE THINGS CREATING ISSUES THAT CONTRIBUTE TO THE WATERSHED POLLUTION ROGER TALKED ABOUT.

Hardberger: (FADE IN) ...and the idea is, we need to see what, if any, laws apply to these people. If I'm a transporter of waste and I'm taking it to a fertilizer manufacturing plant. What permit do I need? It's as simple as that.

KAYLEIGH MILLERICK IS ANOTHER PART OF THIS WATER EQUATION... SHE'S A CIVIL, ENVIRONMENTAL AND CONSTRUCTION ENGINEER AT TEXAS TECH.

Millerick: Wastewater treatment plants, when they're done treating their water, they have to dispose of the water. The water typically goes into a surface water body. There's a permit required for doing that.

THE WAY SHE TELLS IT, SHE GOT A CALL FROM GERRI A COUPLE OF YEARS AGO SAYING THEIR TEAM WAS LACKING IN A WATER ENGINEER AND ASKED KAYLEIGH TO BE PART OF THIS TEAM. IT WAS DIFFERENT THAN ANYTHING SHE WAS USED TO... BUT SHE HAPPILY OBLIGED.

Millerick: I'm an assistant professor without tenure and the majority of my projects involve me working very closely with one other person. The last time that I looked on the CASFER Slack channel, there were 47 names on there and I think there are even more of just people who hadn't accepted the invitation yet. To be able to work with that many people is absolutely astonishing.

Hardberger: ...There's people on the project, me and others that we are, I think designated translators and any project like that needs that. Like I can't do her job. She can't do my job. That's why a good team is possible.

French: Many times, scientists and engineers just want to work in the lab. In our group, actually, Leads in their time are setting things outdoors in the real world.

(Music open)

SO, YEAH. CASFER IS RESPONSIBLE FOR BRINGING A LOT OF PEOPLE TOGETHER FROM DIFFERENT REGIONS ACROSS THE COUNTRY. FROM DIFFERENT BACKGROUNDS OF RESEARCH.

THAT'S WHAT TAKING AN IDEA TO THE NEXT LEVEL REQUIRES.

GERRI SAYS THAT SHE FEELS A SENSE OF RESPONSIBILITY WITH CASFER... WITH ALL OF HER RESEARCH. SHE KNOWS SHE HAS THE ABILITY TO CREATE CHANGE AND SHE TAKES THAT REALLY SERIOUSLY.

Botte: That's how it feels and that's what I feel is exciting. I want to tell you this. I don't know if I ever said this, but I'm first generation. Therefore, the point that I'm making is and still explaining to my mother, she calls me Jetta. That's how I grew up since I was a little kid. She says Jetta. She speaks Spanish, she doesn't speak English. Why are you still studying? Come on. How many other PhD's are you going to get? She does that. You know what I mean? It is hard for somebody who has parents, when you are the first generation, to explain why you never stop studying.

I LAUGH WHEN SHE TELLS ME THIS... THE TRUTH IS I COULDN'T BE MORE RELIEVED THAT GERRI WILL, IN FACT, NEVER STOP STUDYING. THAT SHE IS DOING HER CIVIC DUTY.... HER HUMANLY RESPONSIBILITY. WHAT I HOPE YOU CAN SEE IS THAT THERE IS GENERATIONAL, LONG-TERM SOCIETAL CHANGE AT WORK.

Botte: I think it is the good for generations to come, that transcend any other aspect I could think of....We just had an undergraduate student, he just joined Texas Tech and he immediately learn about CASFER and say, I really need to get involved. That's the type of power that something like this brings for generations to come. The generations today are looking for opportunities like this. That, when they become engineers, they are being responsible and doing things that are resilient, sustainable, and truly circular to impact society generations to come.

(Music close)

(Walking in dirt)

40 MILES NORTH ON I-27, A THICK LAYER OF LOOSE DUST COATS THE TOP OF LAYTON SCHUR'S BOOTS. AS HE WALKS THROUGH HIS EXPANSIVE FIELD OF KNEE-HIGH COTTON, THE SUN BEAMS OVERHEAD, CASTING A LONG SHADOW THAT FOLLOWS HIM, RIPPLING OVER THE BLOOMING CROP. HIS BLUE JEANS ARE LIGHT TAN AND BROWN IN PLACES, FROM KNEELING IN DIRT OR TENDING TO HIS CATTLE.

HE'S A FOURTH GENERATION FARMER... IN FACT, THE FIELD HE'S FARMING TODAY IS THE SAME ONE HIS FATHER TAUGHT HIM TO WORK WHEN HE WAS JUST A BOY.

Schur: There's some pretty good memories of coming home and school and jumping on tractor with your dad and thought that was the coolest thing ever.

HE GRADUATED FROM PLAINVIEW HIGH SCHOOL IN 2013, THEN ATTENDED TEXAS TECH WITH AMBITIONS OF BECOMING A CATTLE BUYER... HE ALSO HAS A HIDDEN TALENT THAT HE THOUGHT HE'D PUT TO GOOD USE ONE DAY.

(Auctioning)

AND HE DID FOR A LITTLE BIT... BUT THE RICH SOIL OF THESE FIELDS COURSES THROUGH HIS VEINS. IT HAS MADE ITS HOME IN HIS SPIRIT.

Schur: Then you've seen what your dad's done, your granddad's done and even your great granddad might have done it as well. It has this weird pull on you and it's really hard to get out of it. You don't really want to, either.

LAYTON IS WHAT I WOULD CALL AN ENTREPENUER. HE'S BIG AG- IT'S A TERM HE TAUGHT ME- WITH CATTLE AND ABOUT 3,000 ACRES OF COTTON, WHEAT AND MILO... HE ALSO TENDS TO ABOUT 25 DIFFERENT FRUITS AND VEGETABLES THAT GROW IN GREENHOUSES AND FIELDS IN HIS BACKYARD. HE AND HIS WIFE, JESSIE, SELL THOSE VEGGIES AT THEIR POP-UP GROCERY STORE IN DOWNTOWN PLAINVIEW CALLED FRONTIER GROCERY.

(Door opening with bells)

IT HAS BEETS, LETTUCE, THE SWEETEST CARROTS I'VE EVER TASTED, PEPPERS, AND BEEF. LOTS OF BEEF. A LOT OF CROPS REQUIRE A LOT OF FERTILIZER. LAYTON SAYS IT'S GENERALLY ABOUT 125 POUNDS OF FERTILIZER PER ACRE. SO, FOR HIM THAT'S A TOTAL OF AROUND 375,000 POUNDS OF NITROGEN FERTILIZER THAT HE USES AT HIS FIELDS.

Schur: The way we're fertilizing out really isn't natural. We robbed the nutrients out and every year at the replace those nutrients somehow.

HE'S NOT PART OF THE CASFER TEAM... BUT HE IS THE REAL-LIFE APPLICATION. I WANT TO BE CLEAR THAT WHILE THESE TWO PEOPLE HAVE NEVER MET, LAYTON IS GERRI'S GREATEST INSPIRATION. HE REPRESENTS THE GROUP OF PEOPLE THAT SHE STARTED DOING THIS WORK FOR ALL THOSE YEARS AGO... BEFORE HE EVEN TOOK OVER HIS OWN FIELDS, SHE WAS PLOTTING. DISCOVERING A WAY THAT SHE COULD CHANGE HIS FUTURE.

Botte: I would say our promise to the end-user, our farmers is to have a price of fertilizer that is extremely competitive and much lower than any price they have. Because of that, that's the inspiration for them to participate in this.

(Music)

LAYTON IS YOUNG, HE HAS WITNESSED THE WAY TECHNOLOGY HAS CHANGED THIS INDUSTRY. AND HE CHASES AFTER THE NEXT MEASURE THAT WILL MAKE FARMING BETTER. AND IT MIGHT JUST BE THE FERTILIZER CASFER WILL PRODUCE.

HE BELIEVES IN THIS BUSINESS. AND IN THESE PEOPLE. HE ADVOCATES FOR FARMERS, THEIR PROCESS, THEIR MENTAL HEALTH. HE SAYS THE FARMING WORLD IS SMALLER THAN YOU THINK AND THAT'S WHAT HE LOVES ABOUT IT.

Schur: It's not necessarily the day-to-day monotony. It's not that. It's when you go out, you check your calf, you reach down, and you tag him and you watch him all the way through the weaning. If you're fortunate enough like us, we watch him all the way till they come to your plate. There's something special about that. You watch that calf's whole life and make sure he had a good life, vaccinated him, kept him healthy. You fed him, and at the end of the day, that's the good stuff. When you watch a cotton field from just germination when it pops out of the ground with two leaves on, you're like, is it going to make it? We going to miss his hailstorm?

Schur: Farmers especially, everywhere, are struggling with a lot of mental health.... It's just because the stress of not only is price going to drop a limit today or is your employee going to quit on you the next day or you get a hedge on the line that didn't work out or, there's a lot of stuff that goes on that it's a struggle.

Schur: But that struggle is also what pulls a family together. Keeps you going to the next day and that's cool stuff too and that's what you enjoy.

GERRI SAYS THAT THIS FERTILIZER IS ALREADY BEING PRODUCED IN LABS TODAY. OVER THE NEXT YEAR THEY'LL BEGIN TESTING IT ON CROPS. GERRI HOPES THAT IN YEAR FOUR OR FIVE OF CASFER, THEY'LL HAVE A PRODUCT AVAILABLE TO FARMERS.

(Music)

IF YOU WANT TO LEARN MORE ABOUT CASFER, YOU CAN FIND INFORMATION LINKED IN THE EPISODE DESCRIPTION.

FEARLESS IS PRODUCED BY THE TEXAS TECH OFFICE OF COMMUNICATIONS AND MARKETING. IT'S WRITTEN AND HOSTED BY ME, TAYLOR PETERS AND CO-PRODUCED BY ALLISON HIRTH. THOMAS BOYD IS OUR AUDIO ENGINEER AND EDITS THIS PODCAST.

FEARLESS IS A TEXAS TECH PRODUCTION. FROM HERE, IT'S POSSIBLE.

HEY GUYS, IT'S TAYLOR... THANKS FOR LISTENING TO THIS BONUS EPISODE OF FEARLESS... IF YOU LIKED IT, MAKE SURE YOU LIKE, REVIEW AND SUBSCRIBE. AND COME BACK, WE'RE WORKING ON THE NEXT SEASON OF FEARLESS.