SUSTAINING MEMBER

TEXAS TECH UNIVERSITY

Researchers from Texas Tech University, in conjunction with four partner institutions, were awarded $51 million dollars from the National Science Foundation (NSF) to establish the Engineering Research Center for Advancing Sustainable and Distributed Fertilizer Production (CASFER). Headquartered at Texas Tech, the center will enable resilient and sustainable food production by developing the next generation of modular, distributed, and efficient technologies for capturing, recycling, and producing decarbonized nitrogen-based fertilizers.

The National Science Foundation (NSF) Engineering Research Center for Advancing Sustainable and Distributed Fertilizer Production (CASFER) headquartered at Texas Tech University strives to solve one of the most pressing problems facing humankind: How do we feed the growing world population while protecting and sustaining our environment?

By 2050, the world population will exceed 10.5 billion, increasing the demand for food by 70%, with only an additional 10% land available for agriculture.

Currently, more than 50% of the world population is supported by synthetic nitrogen-based fertilizers (NBFs), produced via the Haber-Bosch process, a carbon intensive process; however, the high volatility of prices remains a challenge in the US and developing countries. Furthermore, only 20% of NBFs produced translate into food with 80% lost to the environment creating significant environmental, health, and socioeconomic impact. Therefore, society requires new cost effective, resilient, and secure ways to produce NBFs with minimum environmental and socioeconomic impacts.

To address this, CASFER is developing a transformative, engineered system that takes the U.S. from nitrogen cycle pollution to a Nitrogen Circular Economy—that means capturing nitrogen from waste streams and converting it into fertilizer.

"Our approach is a completely sustainable and circular solution, we are capturing waste streams and converting them into nitrogen-based fertilizer and other nutrients, leading toward a circular economy," said Dr. Gerardine Botte, founder and Director of CASFER.

CASFER is working toward developing new technologies for the recovery and recycling of NBFs using byproducts from untapped sources of waste, such as concentrated animal feeding operations, municipal wastewater treatment plants, and fertilizer run-off. These technologies bring the convergence of nanotechnology, electrochemical science, data science, biology, chemistry, environmental and agricultural science, health science, economics, policy, and engineering.

Engineering Research Centers (ERCs) are the National Science Foundation's (NSF) flagship programs. CASFER is a newly awarded ERC with an NSF investment of $51 million dollars to help solve the global problem of food

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production while sustaining the environment. It was founded by Dr. Gerardine Botte, a professor at Texas Tech University, an NAI Fellow, a visionary, and a recognized leader in electrochemical science and technology with more than 25 years of experience and over 60 patents.

CASFER's vision is the product of over 5 years of Dr. Botte's work, a legacy in research, truthful relations with stakeholders and partners, and the support and infrastructure of Texas Tech University. Dr. Botte spent years putting together a collaborative team of the most qualified, intelligent, pioneering researchers in their fields. CASFER'S all-star cast is led by Texas Tech University in partnership with MIT, Georgia Tech, Florida A&M, and Case Western Universities.

CASFER's overall mission is to disrupt the current linear distribution channels and carbon intense methods for making Nitrogen based fertilizers and transform the system to a Nitrogen Circular Economy. CASFER's technologies utilize a no-carbon, low energy method to recycle and recapture both nitrogen and phosphorous from waste streams. Due to CASFER's distributed model, fertilizer availability and reduced costs will benefit local farmers, eliminating factors such as disruptions in supply chain and rising oil and gas prices.

As an NSF Engineering Research Center, CASFER brings together a diverse and multidisciplinary team to foster a dynamic innovation ecosystem. Dr. Gerri Botte and her team are passionate about CASFER's overall mission. More importantly, they understand solutions to global problems must have firm, local roots to blossom and create lasting impact. CASFER recognizes the growing need for sustainable agricultural practices, in terms of food security and environmental impact. CASFER sees how supply chain, cost disruptions, and pollution negatively affect communities and they are working hard to eliminate these issues through reducing nitrogen pollution and also teaching the next generation ways to continue and further develop a Nitrogen Circular Economy.

About the Texas Tech University System

Established in 1996, the Texas Tech University System is one of the top public university systems in the nation, consisting of five universities – Texas Tech University, Texas Tech University Health Sciences Center, Angelo State University, Texas Tech University Health Sciences Center El Paso and Midwestern State University (MSU Texas). Headquartered in Lubbock, Texas, the TTU System is a $2.5 billion enterprise focused on advancing higher education, health care, research and outreach with approximately 21,000 employees, more than 63,000 students, nearly 370,000 alumni and an endowment valued at $1.7 billion. The Office of Research Commercialization (ORC) serves the TTU System, helping to move research discoveries from the university laboratory to the marketplace. For fiscal year 2022, the ORC achieved historic metrics and activity as a result of the vibrant and expanding commercialization efforts across the TTU System, generating just shy of $1.2 million in revenue and executing 36 license agreements.