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Prosthetic Device: Student Lends a Helping Hand to Farmers

CEDARVILLE, OHIO -- Emily Kennell grew up lending a hand to her father on their family farm in Wenona, Illinois, where she saw the demanding daily tasks involved in farming — climbing ladders, lifting bags of seed, maneuvering heavy equipment and fixing industrial products.

Now, as a senior industrial and innovative design major at [Cedarville University](https://cedarville.edu), Kennell was inspired to create a unique tool for farmers — a prosthetic to help farmers work their fields.

With an understanding of farming and prosthetics, Kennell designed an arm and an attachment that will provide a niche use. Pulling inspiration from power tools, she designed the arm with a sturdy metal frame surrounded by a plastic casing. The arm will attach to the bone above the elbow giving the person greater flexibility to exchange attachments to the prosthetic.

“I knew I wanted to work with prosthetics because I am fascinated with the functions of the human body and I wanted to try to imitate [the functions] with modern technology,” said Kennell.

During her ideation process, Kennell talked with [Dr. Tim Norman](#), a distinguished professor of [biomedical engineering](#) at the university. Norman has devoted much of his life and career to helping develop prosthetics, including for his daughter, Grace, who is a three-time U.S. Paralympic medal winner. She won the gold medal in the triathlon at the Paralympics in Rio de Janeiro, Brazil, in 2016.

“As we talked, he found out my dad is a farmer,” said Kennell. “He said prosthetics are normally engineered for white-collar jobs that are traditionally less physically demanding. In the farming industry, there are several prosthetic legs that are functional, but there was a gap in the market for arms.”

Currently, farmers who use prosthetic arms have a traditional hook model, although the taxing nature of farm work often makes prosthetics difficult to use.

“My firsthand experience put me in a great position to understand the needs of the farmers I was trying to help,” said Kennell. “There are so many difficulties in trying to adapt prosthetic models to function on a farm — they need to be able to hold full body weight to climb into machinery. They interact with chemicals and fuel, so the material needed to be durable. The dirt in the air gets stuck in joints, so the arm could not have small joints and pivot points.”

As part of her research, Kennell watched hours of video of people using prosthetic arms. She took extensive notes on how they moved and interacted with the prosthetic.

“I wanted to see not only how they moved, but what they said about the prosthetics,” said Kennell. “I wanted to understand their needs.”

Through her research, Kennell was able to best understand the needs of her audience in order to create a product tailored to help farmers in practical ways.

“The [ICC](#) teaches us that design is rooted in understanding people and their needs,” said Kennell. “I knew that there was a need because current solutions are not durable or practical enough. I hope that my design can someday be brought to life to help farmers.”

Located in southwest Ohio, Cedarville University is an accredited, Christ-centered, Baptist institution with an enrollment of 5,082 undergraduate, graduate and high school dual-enrolled students in more than 175 areas of study. Founded in 1887, Cedarville is recognized nationally for its authentic Christian community, rigorous academic programs, high graduation and retention rates, accredited professional and health science offerings, and high student engagement rankings. For more information about the University, visit www.cedarville.edu.

Written by Halle Johnson

Photo Credits: Emily Kennell

1. A close up image of Emily Kennell's designed prosthetic arm for farmers
2. Drawings from Emily Kennell before the construction of the prosthetic arm
3. a Rendering of the prosthetic arm and attachment
4. Emily Kennell stands in front of the image of the prosthetic