

Ubeyitogullari collected rice husks from rice farmers and processors across Arkansas for a project supported by the National Science Foundation Faculty Early Career Development Program (CAREER) Award.



Photo courtesy of U of A System Division of Agriculture

Turning Rice Husks Into Sustainable Materials

Rice husks have long been considered a low-value byproduct of rice production, often posing disposal challenges for farmers and processors. Now, researchers are exploring ways to transform this agricultural waste into valuable, environmentally friendly materials.

Ali Ubeyitogullari, an associate professor in the Department of Food Science and the Department of Biological & Agricultural Engineering at the University of Arkansas Division of Agriculture, is leading studies focused

on upcycling rice husks into advanced porous materials known as aerogels for use in drug delivery systems and sustainable packaging.

"Rice husk is an underutilized byproduct of rice processing, generated in large quantities. This creates challenges for farmers due to the limited value of the material and environmental disposal issues," he says.

Ubeyitogullari collected rice husks from rice farmers and processors across Arkansas for a project supported by the National

Science Foundation Faculty Early Career Development Program (CAREER) Award. The research, conducted at the Arkansas Agricultural Experiment Station with a team of collaborators, aims to advance understanding of how agricultural and food-processing byproducts can be converted into high-value aerogels.

"The goal of this research is to improve our understanding of how nanoporous aerogels can be made from agricultural and food-processing byproducts. Specifically, we're upcycling rice husks into high-value aerogels using a technology called supercritical carbon dioxide drying," Ubeyitogullari says.

In this process, carbon dioxide acts as a nontoxic, abundant and recyclable solvent, offering a more sustainable alternative to traditional manufacturing methods.

According to Ubeyitogullari, the specialized drying process helps maintain the material's structure and performance.

"Supercritical carbon dioxide drying allows us to produce highly porous materials while preventing the shrinkage that typically occurs during conventional drying methods such as air drying or freeze drying," he says. "The resulting materials are biodegradable aerogels made from agricultural byproducts. Because they come from natural materials,

they can break down in the environment and don't accumulate like traditional plastics."

The aerogels could be used in a variety of applications, including food-ingredient delivery systems, sustainable packaging, and other value-added products. The research may also help reduce waste and support more sustainable manufacturing practices.

"This research can help reduce waste, add value to agricultural materials that are often discarded, and support the development of more sustainable materials for different applications," Ubeyitogullari says.

Although the project is still in its early stages, the long-term vision is to move these innovations beyond the laboratory and into real-world use.

"In the long term, we'd like to find practical uses in areas such as food systems, packaging, and other sustainable products," Ubeyitogullari says. "Our goal is to create new opportunities for agricultural byproducts while reducing waste and supporting a more sustainable economy."

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With visual search, customers simply take a photo of the part they need, filter by their equipment model, and quickly receive accurate results.



AI Helps Find Replacement Parts

Case New Holland (CNH) is taking artificial intelligence to another level by creating an AI-powered visual parts search that helps customers (whether a farmer in the field or a contractor on a job site) identify the right replacement parts faster and more efficiently.

"Finding the correct part can be time-

consuming," says Paul Zirk, CNH Parts & Service eCommerce Operations, Digital Marketing & PMO. "Often, the part number isn't visible because it's worn off or not present at all."

Typically, farmers manually search equipment catalogs, navigating to the right section

and identifying the part, a process that is time-consuming and can slow repairs.

"With visual search, customers simply take a photo of the part they need, filter by their equipment model, and quickly receive accurate results, helping reduce downtime and get machines back to work sooner," he explains.

Zirk believes visual search has practical value. Fully integrated into the MyCNH Store (www.mychnhstore.com), CNH's online parts platform for agricultural and construction equipment, the feature lets customers take a photo of the part they need or upload one and refine results by equipment model.

On a smartphone, the process begins with the camera icon in the search bar. On a desktop computer, users can simply upload a saved image. After cropping the photo to focus on the part, they receive ranked matches and detailed part information, including descriptions, fitment, kit details, pricing, stock, and shipping or pickup options through a selected dealer.

The result is a faster, more intuitive path

to the right part and less downtime for customers. Just as important, CNH is using customer feedback via a thumbs-up or thumbs-down feature to improve the tool's machine learning performance over time.

The company has already expanded coverage to current production tractors, combines, engines and a wide range of construction equipment.

"As we roll out visual search to additional equipment, we continuously evaluate the data to ensure a high-quality customer experience. Our goal is to expand coverage across all current product lines first, and once that's complete, evaluate opportunities to support earlier models," Zirk says.

Because the feature is available to all MyCNH Store users in the U.S. and Canada, as well as to enrolled dealers, it's offered at no additional cost.

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Company Makes Precision Ag Technology More Accessible

Cutting-edge precision agriculture has often seemed viable only for large farms with the capital to make large purchases. Farmonaut, a precision agriculture company, is challenging this assumption. By using satellite imagery, artificial intelligence, weather prediction, and digital advisory tools, the platform aims to deliver a more accessible model for farm decision-making, one best suited where margins are tightest and agronomic support is hardest to reach.

Instead of requiring farmers to install specialized hardware, Farmonaut relies primarily on satellite data and software.

"The barrier to entry is very low," says Ankur Omar, Farmonaut's CEO. "No specialized sensors, drones or on-farm equipment are required for most services. Just a smartphone or computer, internet access, field boundaries, and either a subscription or partner access."

He adds that advisory reports can also be delivered via WhatsApp, a practical option in regions where farmers aren't familiar with complex dashboards but rely on mobile messaging.

Many farmers still detect crop stress only after visible damage has occurred. They may overapply fertilizer, pesticides or water

because they lack field-level data or struggle to obtain qualified agronomic advice in time to prevent losses.

Farmonaut promises to turn remote sensing into timely guidance by monitoring crop health, detecting vegetation changes, tracking soil moisture and water stress, informing irrigation and nutrient decisions, issuing pest and disease alerts, and forecasting yield performance.

The potential benefits are significant and help farmers intervene before losses become severe.

The platform also has broader applications for agribusinesses, cooperatives, governments, lenders, insurers and buyers that need scalable verification, traceability or environmental impact data. Farmonaut reports broad global use by more than 200,000 farmers. Monitoring is underway in many countries, reinforcing the idea that satellite-first systems can scale beyond local pilot projects.

What differentiates Farmonaut from many established precision agriculture offerings isn't merely technology but positioning. Its satellite-first approach avoids expensive field equipment and makes the system more feasible for small and medium-sized operations, including farms in developing regions.

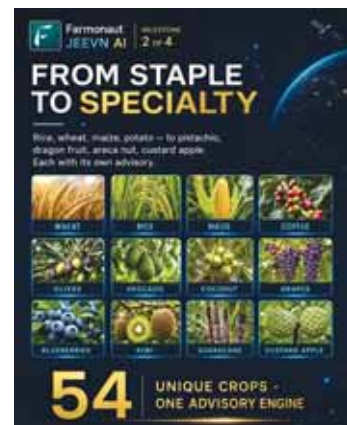
"Farmonaut is explicitly designed for farms of all sizes. While large farms often realize substantial ROI, we're built to make precision agriculture affordable and accessible at every scale," Omar says. "Our stated core mission is empowering smallholder farmers and revolutionizing agriculture for a sustainable future, particularly in developing markets like India, Africa and Southeast Asia, where smallholder farming dominates."

Its combination of AI advisory, weather forecasts, APIs, blockchain-enabled traceability, carbon monitoring, and fleet or resource tools makes it an integrated agricultural intelligence platform rather than a single-use app.

"Our platform is globally accessible. Since it relies primarily on satellite data, farms can be monitored in most regions worldwide where satellite imagery is available," Omar says.

Farmonaut operates on a subscription-based model with tiered plans based on the number of hectares monitored. Pricing is designed to be accessible to farms of all sizes, starting at approximately \$4.99 per month and increasing incrementally to \$224 per month for the largest land bases.

"Farmers pay only for the coverage and



Farmonaut's satellite-first approach avoids costly field equipment and makes the system more feasible for small and medium-sized operations.

services they need. API access and developer integrations are also available for businesses embedding Farmonaut data into their own platforms," Omar says.

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