



Bayer's battery-powered tractor appears unchanged after the conversion.

E-Cub Conversions Continue

Bill Bayer's goal of converting a garden tractor to battery power for mowing his yard seems never to end. The project started with the conversion of an old Murray lawn tractor, which he used with a pull-type mower converted to electric power.

"The Murray had a weak transmission, so I fabricated an articulating 4-WD Cub I call Artie," says Bayer (Vol. 49, No. 1). "It worked great, but it took too much energy to cut the lawn. The old Murray did it with two-thirds the energy."

He decided to convert a Cub 1000 to battery power, but with more energy storage, to replace the Murray and outwork Artie. He also wanted hydraulics instead of using actuators for the 3-pt. and other lifting needs, as he had on Artie.

"The actuators are slow and have about half the power that was advertised," says Bayer. "They also don't allow for float, such as back dragging with a loader."

That was important because he wanted to

replace his Kubota BX2200 with its front-end loader. Plans included mounting a belly mower to replace the pull-behind used with the Murray and Artie.

Bayer nicknamed his new project Ms. Cub. He started the project on August 25, 2024, and mostly finished it about 10 mos. later. During this time, he created and posted 24 videos on his YouTube channel. These videos include detailed explanations of various steps, setbacks, and recovery as the project became increasingly complex.

Some of the complications arose from adding a second motor, in addition to the traction motor. It was designed for use with the intended belly mower, as well as the front and rear e-PTOs.

One goal for Ms. Cub was that everything be neat and contained. His attraction to the old Cub 1000 was partly due to its large engine compartment and full side panels, all of which were metal.

"I wanted to make it look cleaner than Artie

or the Murray, which I did to a fault," says Bayer. "When you open the hood, all you see is a removable black box that holds the batteries, the battery equalizer and two wires. The motors sit under it, and the controller and charger are mounted alongside."

All the electronic components are stored in their own compartment beneath the dash panel. The hood and side panels shield everything from the elements. As a result, the battery-powered tractor keeps its original look after the conversion.

Other things didn't go as planned. After thoroughly prepping a 44-in. deck with re-built spindles, cleaned and repacked bearings, and fresh paint, he set it aside.

"It uses a tremendous amount of power," says Bayer. "The blades spin faster and make a nicer cut, but it uses twice as much power as my pull-behind. This reduces the amount of lawn I can cut on a charge in half."

He also dropped the idea of hydraulics, a front-end loader and a 3-pt. hitch, with or without actuators.

He's in the process of fine-tuning a flail mower for use on Ms. Cub, but so far without luck. He initially developed it for mounting to the front end of Artie.

"It worked amazingly well and did a beautiful cut, but it put so much stress on the frame

that it bent it," says Bayer. "It also vibrated really bad. The geometry was wrong as well. If I drove up hill, it would dig into the ground."

He has been working on a rear mount for it on Artie. Instead, he's considering mounting the flail mower on the front of Ms. Cub. Meanwhile, he's using the 1000 with his pull-behind mower.

"If I can't get the flail mower to work, I may get a 52-in. deck and mount it to the front end of Ms. Cub for a better cut," says Bayer.

Eliminating the belly mower leaves that motor underused. Bayer might use the cog sprocket on it to run a hydraulic pump or the previously mentioned front-mounted mower deck.

One thing is clear: the conversion saga will continue.

"I'm having some problems with the throttle tensiometer sending erratic signals to the motor controller, making operation a little jerky," says Bayer. "I'll have to get a new tensiometer, take out the battery and undo all the cables."

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Electronic components are stored in their own compartment beneath the dash panel.

Transforming Agricultural Waste Into Packaging

University of Queensland's Dr. Nasim Amiralian and her team of researchers have found a novel use for sugarcane waste. They're turning the nanofibers extracted from biomass residue into sustainable green products, including a new type of bio packaging that incorporates antimicrobial materials, also derived from biomass waste, to kill viruses and bacteria and help extend the shelf life of grocery store produce.

Sugar comprises only 15% of the sugarcane plant, so a large portion of the stalks and fiber typically becomes waste.

Amiralian's research began with a goal of finding a use for this large amount of discarded biomass.

"We have a lot of sugarcane waste in Australia," Amiralian says. "The process we've developed is single-step, cost-effective and simple. It's a good alternative for paper-based packaging, with improved mechanical properties without the need for the addition of plastics or non-biobased moisture-repellent materials."

She explains that the building blocks of plants are very thin, strong, long fibers, which are used as an additive to improve the mechanical properties of various polymers. At the same time, these nanomaterials, nanofibers, are used as a template to introduce desirable functionality into fiber-based packaging materials, significantly improving the shelf life of foods and fruits and creating antimicrobial packaging.

When the new packaging is used, if someone with the flu touches it, the next person handling it won't become sick, as the antimicrobial materials kill bacteria, COVID and Influenza A, in less than 30 min.

"Agricultural waste-based packaging is



Sugarcane waste turns nanofibers extracted from biomass residue into a new form of biodegradable packaging.

a sustainable alternative to plastics, as it repurposes residues that would otherwise be discarded, reducing greenhouse gas emissions and reliance on fossil fuels," Amiralian states. "Unlike conventional plastics, it's biodegradable and doesn't generate harmful microplastics, making it safer for the environment and human health. This approach supports a circular economy by turning waste into value while promoting cleaner, greener production systems."

Amiralian hopes the antimicrobial-coated packaging will be on grocery shelves within four years. Her team is also investigating other biomass waste to make 100% biobased and biodegradable packaging materials. They're seeking investors to advance the technology to the next level of commercialization.

"Going forward, it's hoped that we can demonstrate translation of our lab-scale formulation to the real-world application and create impact by reducing waste, carbon emissions and plastic pollution."

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Drill-Powered Cultivator Helps Maintain Soil

The Fusion Drill Cultivator aims to make it easier to maintain raised beds and other cultivated soil spaces. It's compatible with most cordless drills and features an adjustable tilling width of up to 8 in., with a tilling depth of up to 5.5 in.

Weighing just 7 lbs. (before adding your drill), it's made from high-density plastic and machined aluminum. An oversized handle allows for comfortable positioning, while the side support bars improve control around delicate plants.

The cultivator operates in a full-size mode (51 in.) for standard garden plots and a shorter mode (19 in.) for raised beds. It's not suitable for breaking new soil or other large gardening projects that typically require a gas-powered tiller.

Many battery-powered cultivators fail because they aren't used enough. The Fusion Drill Cultivator provides more convenience by using a multi-purpose cordless drill, making it easier to keep it charged and ready to use.

It needs an 18-volt brushless cordless drill with at least 300 lb-in. of torque and a 3/8-inch chuck. The company recommends a battery capacity of 3.0 Ah or higher.

While all drills differ, they typically work best at the lowest speed setting, usually "1" or "Lo." Similarly, Fusion advises setting the clutch torque to its lowest level, then gradually increasing it and testing the engagement of the cultivator tines with the soil. The ideal speed lets the tines turn the soil without slipping the drill's clutch or causing the drill to stop too easily in the soil. Never operate the Fusion cultivator in "hammer drill" mode, as it can damage both the drill and the cultivator.



Cultivator provides more convenience by using a multi-purpose cordless drill, making it easier to keep it charged and ready to use.

Customer reviews show that the tiller works well for clearing weeds between rows or around plants and mixing amendments into soft soil. Some users found it worked for tilling with enough patience, even through frozen ground. Many reviewers expressed surprise at how powerful the cultivator was. A few highlighted the importance of running the drill at low speeds to prevent the tines from throwing dirt everywhere. One reviewer shared that the Fusion Drill Cultivator completely replaced the 2-stroke cultivator they'd relied on for years.

Fusion Drill Powered Tools, based in Cumberland, Wis., has been in the outdoor products business since 1960. The Cultivator costs \$129.99 on the company's website.

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