PRESS BACKGROUND
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About the Winners of Wege Prize 2022 —

Game-Changing Sustainable Solutions for the Circular Economy of the Future

1st Place ($30,000) – Green Promoters

Institutions represented: Davis College (Rwanda), Rwanda Institute for Conservation Agriculture, United Arab Emirates University

Disciplines represented: Conservation Agriculture, Electrical Engineering, and Entrepreneurship

What if we could reduce the negative effects of chemical fertilizers and pesticides by producing a new blend of organic pesticide and fertilizer, together?

The team Green Promoters created a way to reduce and eliminate the effects of the chemical pesticides and fertilizers by developing and marketing their own organic pesticide-fertilizer, called EZA Two-in-One. The product can be used as a pesticide and fertilizer at the same time, and it is shown to be environmentally friendly, safe, and affordable. The new product and processes benefit the challenges of waste and idle resources in various community, while creating new opportunities. The introduction of EZA Two-in-One promises to reduce the costs of imported inputs, while also promoting safety in agricultural production

"Chemical pesticides and fertilizers are dangerous to the farmers, consumers and environment," according to the team. "At global scale, they are also leading to critical and long-term health impacts"

Green Promoters notes recent United Nations statistics showing about 385 million cases of acute poisonings annually, with approximately 11,000 deaths. This means that 44% of the global population working on the farms are poisoned every year. "This is a serious issue, especially in Rwanda, where 70% of the population depends on agriculture," they say, citing 2022 data from the U.N.'s Food and Agriculture Organization. "Most farmers are not skilled in the proper use of agrochemical inputs, and they lack protective equipment," adds Green Promoters. "This increases contamination risks, and has led to extreme environmental degradation and human and animal health hazards."

Green Promoters developed a combination organic fertilizer and pesticide from a mixture of eight materials including invasive plants and organic wastes found in their region. The production concept for EZA Two-in-One takes advantage of natural resources such as *Tagetes minuta*, the pencil cactus *Euphorbia tirucalli*, *Lantana camara*, chili waste as well as garlic and tobacco. Their essential ingredients act as pesticide, with the addition of chicken manure and cow urine as fertilizer nutrients. This resulting liquid product is highly effective for sustainable farming — performing better than standard chemical pesticides and fertilizers.

What the judges said: "The wicked problems of food and human soil contamination are systemic and worldwide. This solution addresses these problems with a low-labor and low-cost approach that protects

biospheres. In tackling some of the most challenging issues facing all life on earth, the proposal by Green Promoters has addressed them very creatively." — *Bill Stough*

2nd Place ($20,000) – Neocycle

Institutions Represented: University of Calgary (Canada)

Disciplines Represented: Bioinformatics, Biological Sciences, Chemical Engineering, and Cellular, Molecular and Microbial Biology

What if we could circulate a supply line for all rare-earth elements and reverse the adverse impacts of rare earth mining while providing a path of reintegration for critical materials?

Rare earth elements, known as REEs, are ubiquitous in everyone's day-to-day lives and essential in many modern technologies, from personal laptops to catalytic converters in vehicles. As the demand for rare-earth elements has been growing exponentially, the current supply chain cannot sustain global demand. Neocycle aims to utilize electronic waste, a massively untapped source of REEs, to develop a novel and sustainable synthetic biology approach for circular REE extraction, recovery, and usage.

Says the team, "Currently, REEs are sourced through mining — an environmentally harmful, time-consuming, and expensive process. In the limited instances where REEs are recycled, it is done using processes such as hydro- and pyro-metallurgy, both of which release toxic byproducts. These methods also require complex chemical steps, resulting in poor working conditions."

Neocycle's solution offers an alternative with numerous competitive advantages over conventional REE recovery. Customers will obtain increased value from waste processing, and benefit from a safer, more energy-efficient, and more eco-friendly approach — all while maintaining a similar recovery rate.

With their viable and long-term solution to the REE scarcity problem, Neocycle promotes the formation of a circular economy, where end-of-life products are repurposed as a new source of precious materials. Currently, over 2.7 metric tons of raw ore are required to produce just 1 kilogram of the REE neodymium, with a heavy environmental cost of 247 kilograms of CO_2. It's an energy-intensive and complex process with numerous steps of physical and chemical separation.

Instead, Neocycle's biology-based *REE-cover* system captures REEs from a much more sustainable source, bypassing environmentally damaging mining practices. Unlike traditional mining, by manually isolating e-waste components high in specific elements, the *REE-cover* system can produce a consistent concentration of certain REEs. This process enables a more predictable output with less operational complexity.

What the judges said: "What a problem we've got with e-waste, and this team has come up with an idea to solve it that could have legs, and that's very exciting. We were very impressed with the size of problem, and that the team has already begun building relationships with local recycling facilities—that will be crucial to scalability. Recycling rare earth elements can be technically difficult, so Neocycle's success thus far is highly commendable." — *Colin Webster*

3rd Place ($10,000) – AquaPro

Institutions Represented: Universidade Eduardo Mondlane (Mozambique), University of Maryland Global Campus (United States), Chengde Medical University (China), Kwame Nkrumah University of Science and Technology (Ghana), University of Ghana

Disciplines Represented: Medicine, Petroleum Engineering, Psychology and Physics

What if we could reduce water pollution with an innovative aquaponics system to grow fish, vegetables, and duckweed?

The AquaPro team solves the wicked problem of water pollution with an innovative aquaponics system that combines the recirculation of aquaculture with plant culture in the absence of soil (hydroponics). Their team focuses on growing fish, duckweed, and vegetables, where high-nutrient water is circulated from the fish to the crops. The crops then absorb the nutrients in the circulated water in order to grow new products without soil or excessive fertilizer application. The new duckweed, in turn, feeds the fish, significantly reducing the use of external fish feed. Waste from human consumption of vegetables and fish is recirculated back into the aquaponics systems as a compost liquid to supplement crop growth. In this way, the cycle of nutrients is constantly flowing from fish to plants to humans.

"In many countries, the biggest source of water pollution is agriculture," according to AquaPro, citing U.N. FAO data. "Yet worldwide, the most common chemical contaminant found in groundwater aquifers is nitrate from farming. Farms discharge large quantities of agrochemicals, organic matter, sediments and saline drainage into water bodies." To solve this wicked problem, AquaPro's process removes inorganic fertilizer application from the cultivation of vegetables as it reduces water usage by up to 90% and maximize crop yield. The plan also reduces land usage and eliminates massive sources of waste — maximizing resources in many interconnected ways.

Most important, AquaPro's concept reduces the pollution associated with agriculture. The sources of pollutants are either eliminated — such as the chemicals used in farming — or they are kept in a loop of circular reuse, as with the uneaten fish feed and their excreta. In the process, the team offers a glimpse of an unusually sustainable approach to tomorrow's aquaponics farming.

What the judges said: "We've seen similar kinds of solutions in the past, but none as well-developed and thoughtful. When it comes to food production — and especially *healthy* food production — we really appreciated seeing a solution that was absolutely circular at its core. The use of appropriate and local technology is right on the mark, and gave the judges confidence that this solution could be implemented in the short term and on a broader scale down the road. We loved the focus on cultural resources and food, on using solar power, and on making such effective use of space and local resources." — *Nathan Shedroff*

Detailed information on the winning teams is found at www.wegeprize.org/2022-winners and high-res images are available https://bit.ly/3tD0fFP -- contact C.C. Sullivan for more information.

About Wege Prize

Wege Prize, a West Michigan-born concept developed by Kendall College of Art and Design of Ferris State University's (KCAD's) Wege Center for Sustainable Design with the support of The Wege Foundation, is an annual competition that ignites games-changing solutions for the future by inspiring college students around the world to collaborate across institutional, disciplinary, and cultural boundaries and redesign the way economies work. To learn more, go to wegeprize.org.