

## A Startup Deploys Black Soldier Flies in the Philippines' War on Waste

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*Maggots are considered gross since they thrive best in stinky, decaying organic matter such as animal waste and plants. The mere sight of them in a household often prompts a frantic search for a can of insecticide.*

But in Davao City, the hometown of Philippine **President Rodrigo Duterte**, the black soldier fly or BSF (*Hermetia illucens*), an insect that many confuse with a wasp, is making a buzz as an innovative solution to address the problem of kitchen waste — benefiting both the environment and agriculture.

Located 960 kilometers (600 miles) south of the capital Manila, Davao is the largest city in the Philippines in terms of land area, and has grown as the major metropolis in the southern Mindanao region with its catchy “Life Is Here” slogan. Its population has grown from 1.1 million people in 2000 to an estimated 1.8 million in 2020.

More people means more garbage. Data from the City Environment and Natural Resources Office (CENRO) show that Davao has generated at least 600 tons of garbage daily since the COVID-19 pandemic started last year, with about half considered biodegradable that could have been composted at home to make fertilizer. Eighty percent of the trash is from households, while the rest comes from commercial establishments.



Data show that Davao has generated at least 600 tons of garbage daily since the COVID-19 pandemic started last year, with about half considered biodegradable that could have been composted at home to make fertilizer. Image courtesy of FiveDOL.

Aiming to turn that trash into treasure, an eco-agricultural startup is piloting a program to produce compost and animal feed using black soldier flies. FiveDOL Upcycling Corp. started commercial operations in March 2021, and is the first such outfit of its kind in Mindanao (a few similar initiatives are launching in the northern Luzon region of the Philippines). It uses techniques developed with the help of the Swiss Federal Institute of Aquatic Science and Technology (Eawag).

“Food waste is a good resource that we can create value from while at the same time helping to conserve the environment and address the problem on biodegradable kitchen waste using the black soldier fly,” **Peter Damary**, FiveDOL’s chief executive officer, told Mongabay in a video interview.

By harnessing the rapid growth of the flies and their capacity to break down kitchen waste, scientists and engineers have, over the last few years, been able to develop an efficient technology to transform large quantities of kitchen waste into insect protein and compost beneficial to agriculture and the environment, Damary said.

Despite its wasp-like appearance, black soldier flies don’t sting. A female can produce between 500 and 900 eggs during its two-week lifetime. The larvae, once mixed with kitchen waste, grow very quickly: From 1 millimeter in length, the black soldier fly larvae can reach 27 mm (1 inch) long and 6 mm (0.25 in) wide, and can weigh up to 0.22 grams, nearly as much as an aspirin tablet, after just 18 days.

Damary said the black soldier flies, which originated in the Americas, have long been present in the wild in the Philippines and do not pose risks to the local ecosystem, or worse, become invasive. The adult flies naturally die after two weeks and they thrive only on decaying wastes. Black soldier flies have significantly reduced mouth parts compared to

housefiles; they don't bite and are not known to transmit any diseases.

During the larval stage, they consume and convert large quantities of food waste into compost, while the larvae grow rich in protein and can be used as alternative feed for chicken or pigs.



Chickens feeding on protein-rich black soldier fly larvae. Image courtesy of FiveDOL

Commercial feeds are usually produced using fishmeal, which has been partly blamed for depleting fish populations from the seas; or soybeans from Latin America, where industrial-scale farming drives deforestation and consumes high volumes of pesticides and fertilizers. Black soldier fly larvae can be a substitute to these commercial feeds — and making that switch will help save precious ocean resources and prevent further deforestation for soy cultivation, Damary said.

“The compost produced by black soldier flies can give back life to the soil for organic farming,” he added. Damary, a Swiss national married to a Filipina and long based in Davao, founded FiveDOL in 2019, inspired by the success of black soldier fly larvae ventures in Europe, South Africa, China, Malaysia and Indonesia.

FiveDOL is locally promoted as LimaDOL. “*Lima*” means “five” in Filipino, while DOL stands for “day-old larvae” — hence, five-day-old larvae, which is the crucial period for black soldier fly larvae.

FiveDOL formally launched a facility on May 27 in Barangay Tacunan, a village of nearly 13,000 people some 15 km (9 mi) from the heart of Davao City. Barangay Tacunan has already proven receptive to environmental initiatives and collaborations: it holds regular radio programs promoting environmental protection, requires residents to plant at least five types of vegetables on their properties, and received a local award for “outstanding initiatives in environmental protection and management” in 2018.

FiveDOL's project has drawn the support of the Tacunan village government as well as the



Sustainable Davao Movement (SDM), a coalition of environmental multisectoral organizations in the city.

So far, at least 50 households have voluntarily joined the zero-kitchen-waste initiative, and several small-scale farmers have started using the compost it produces. The participating households in Tacunan have been trained to properly segregate their kitchen waste, which the company regularly collects without a fee.



A black soldier fly laying eggs. A female can produce between 500 and 900 eggs during its two-week lifetime. Image courtesy of FiveDOL.

Damary says his company aims to be profitable, while also promoting organic agriculture and helping the city solve a mounting waste-management problem.

Davao City has mandated the segregation of solid waste and banned the use of single-use plastics to help reduce its mounting garbage problem of the locality. Under a local ordinance, failure to separate waste is punishable with a fine of up to 5,000 pesos (\$100) or a jail term of up to six months.

CENRO chief Marivic Reyes says that despite continuous awareness campaigns, many households still don't practice proper waste separation, which is part of the reason why the city's waste landfill is quickly exceeding capacity.

The landfill, in the outlying village of Tugbok some 15 km from the city proper, was opened 10 years ago with a capacity of 800,000 tons. As of 2016, the landfill had accumulated 900,000 tons of waste. The local government carried out rehabilitation that allowed the city to continue using it until now, while looking for an expansion area. It is also eyeing the establishment of a 2.5 billion peso (\$51.3 million) facility to burn the solid waste to generate electricity, using a grant from the Japanese government.

The city's solid waste problem is also compounded by the lack of material recovery facilities at the grassroots level, where garbage can be sorted either for composting or recycling. Of

the city's 182 villages, fewer than a dozen have such functional facilities.

Damary noted that if FiveDOL can get hold of 200 tons of kitchen waste daily and compost it using black soldier flies, that would help tremendously in conserving the environment and reducing the pressure on the city's exhausted landfill. Aside from leaching that causes health hazards, kitchen waste in landfills contributes to greenhouse gas emissions, with each ton of kitchen waste producing the same amount of carbon dioxide equivalent in the form of methane, he said.



BSF larvae can be a substitute to commercial feeds for chicken and pigs such as fishfeed and soybeans; making this switch can help save precious ocean resources and prevent further deforestation. Image courtesy of FiveDOL.

**Carmela Santos**, director of Ecoteneo, the environmental advocacy arm of the Jesuit-run Ateneo de Davao University and one of the members of the Sustainable Davao Movement, described the black soldier flies as “friends of the earth and a community’s treasure.”

“It is an amazing demonstration of science at work and technology that works for a carbon-neutral world,” she said. An opponent of the city government’s waste-to-energy project,

Santos says the black soldier fly technology shows that waste can be managed without subjecting the public to health risks like air pollution and food contamination associated with incineration.

“Organic solutions and composting technology like BSF will help our homes become waste-proof, our communities prepare to be pandemic-proof, and our world become climate-proof,” she said.

With FiveDOL’s venture gaining the support of local environmentalists, Damary says he’s upbeat that BSF can invade other parts of Mindanao and become the army that will address the problem of household kitchen waste.

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*Featured image: A black soldier fly on a red leaf. Image courtesy of FiveDOL.*

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