

The Black Soldier Flies (*Hermetia illucens*) Help Combat Tunisia's Drought Crisis

"I feel my day is more sustainable after collecting a large amount of organic waste to be recycled by black soldier flies in my hometown of Medenine."

This post was shared by 35-year-old Fawzia Mahdawi, along with a photo of her driving an auto rickshaw (tuk-tuk) filled with waste containers and bags to present her "Black Soldier Fly" (BSF) farming project. Fawzia's project aims to recycle waste and transform it into natural fertilizer capable of improving plant production, rehabilitating soil, and, most importantly, minimizing water consumption.

The BSF farming project emerges as drought and climate change increasingly impact Tunisia's agricultural system and farmers' resources. It offers a potential strategy for adapting to drought, a consequence of climate change that worsens with each passing year and disproportionately affects the most vulnerable populations. This underscores the unequal burden placed on certain groups in the face of these environmental challenges.



Fawzia Mahdawi collecting organic waste

A childhood passion that has evolved into an eco-friendly project!

In the Wajh al-Lagha area in Beni Khedache delegation in the Medenine Governorate, southeast Tunisia, Fawzia used to play as a child in the soil that was full of different kinds of insects, including scorpions. She was passionate about this world, as seen by the questions she would frequently ask her mother about the varieties of insects, their lives, and how they reproduce.

Fawzia lost her job at a travel agency in 2020 due to the COVID-19 pandemic, so she returned to her childhood interest in quest of investment opportunities for her personal account. Then she found the idea of black soldier fly farming to recycle waste and produce natural materials.

She began to leverage her tourist expertise and connections to transfer a large number of BSF from tropical and subtropical areas to Tunisia. In Medenine, Fawzia prepared an appropriate environment for the growth and reproduction of these flies in terms of lighting and temperature. Every weekend, Fawzia would gather rotten vegetables and fruits left behind by the city's weekly market vendors to feed the flies. In doing so, she not only supported their growth but also helped clean up waste-filled areas plagued by mosquitoes, pests, and unpleasant odors that troubled the local residents.

The initial steps were challenging for Fawzia, as she ventured into a field far from her academic background in Informatics and Multimedia. She also had to face the reactions of a community unaccustomed to seeing a woman collecting waste. However, Fawzia remained unfazed and she pursued her interest with determination and the support of her family, as well as various national organizations that provided her with training and guidance, such as the "Enterprise Incubator" in Medenine, a government institution that encourages young people to start private businesses.

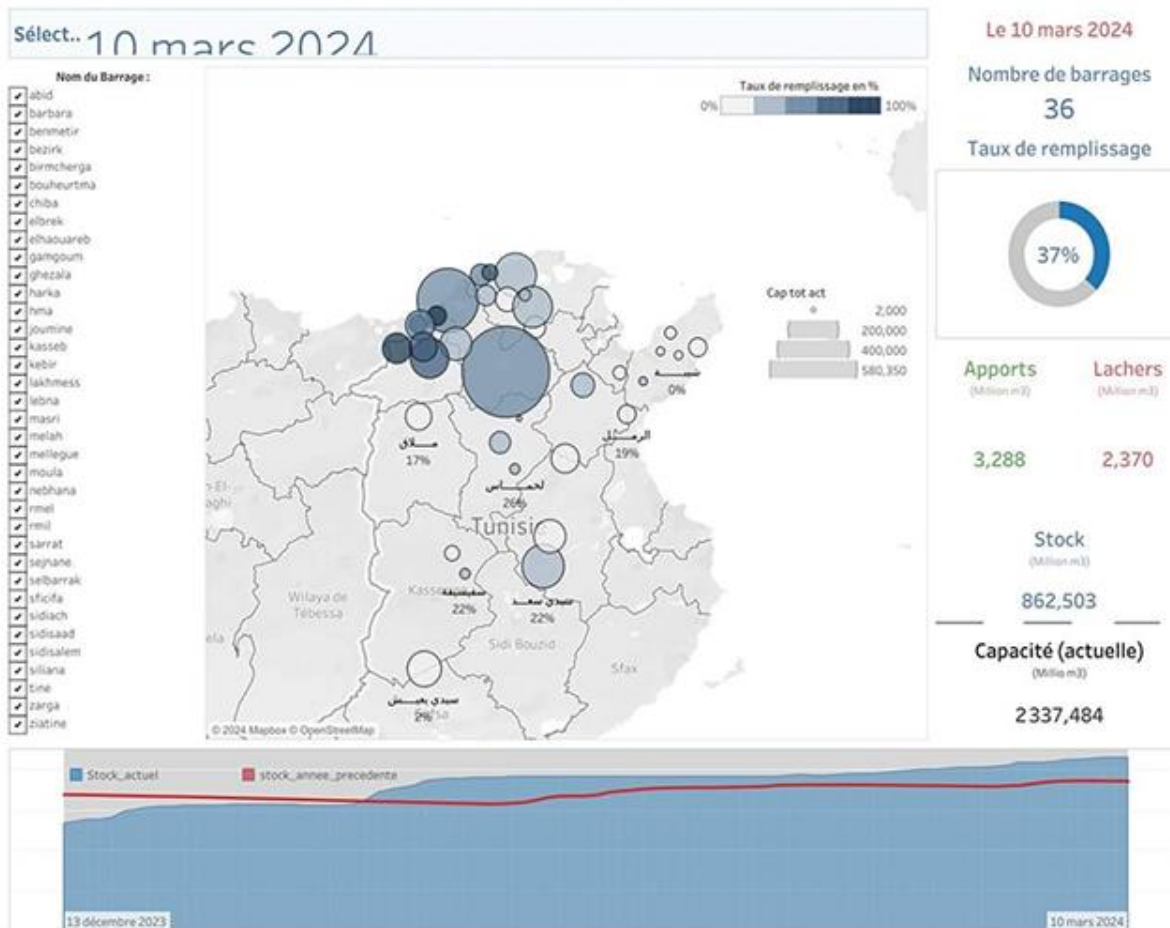
Transforming organic waste into natural fertilizer to combat drought and its damaging effects on Tunisia's agricultural system.

According to Fawzia, "Black soldier flies consume organic waste from rotten vegetables and crop residues, transforming it into a natural fertilizer that is rich in nitrogen, iron, and especially chitin. This fertilizer not only enriches the soil and boosts plant productivity but also decreases the amount of irrigation water needed by approximately one-third."



Composition of organic fertilizers produced by Fawzia Mahdawi's project.

Fawzia offers this solution as a means of adapting to the climate challenges caused by the drought that Tunisia has faced in recent years, which has adversely impacted the country's water resources. As reported by the National Observatory of Agriculture, the dam filling rate was only 37% on March 10, 2024.



Filling percentage of Tunisian dams on March 10, 2024.

Recent preliminary findings from a study conducted by the Platform for Agricultural Risk Management (PARM) in collaboration with the Ministry of Agriculture, Water Resources, and Fisheries indicated that Tunisia may face the loss of approximately one-third of its olive crop and around 350,000 tons of grain due to extreme agricultural risks.

Drought has a particularly apparent influence in southeastern Tunisia, where the climate is generally dry and semi-arid. This condition has harmed farmers' resources in recent seasons, like Khaled Meftahi from Medenine and Rawda Ghaziel from the island of Djerba. Three years ago, they considered leaving agricultural activities due to rising irrigation expenses and a drop in production caused by water constraints and inadequate rainfall.

However, today the two farmers have changed their perspective after using the BSF fertilizer produced by Fawzia's project.

“I’ve noticed that my olive trees are greener,” says Khaled Muftahi after using the fertilizer. He also mentioned that the production volume has increased, noting that olive trees planted two years ago had begun to bear fruit this year in "record numbers."

On the other side, Rawda Ghazil states that she has "reduced her irrigation costs by a third since trying the fertilizer."

From a scientific perspective, Mohamed al-Wassar, a researcher at the Laboratory of Eremology and Combating Desertification at the Arid Regions Institute (IRA) in Médenine, describes BSF as larger than a regular fly, and it primarily found in tropical and equatorial regions; however, it can also be farmed in other countries, including Tunisia, as proved by Fawzia Mahdawi and, before her, another company that distributes BFS-produced natural products.

This insect is well-known for its remarkable capacity to consume organic waste in its larval form and transform it into a natural fertilizer that revitalizes the soil. This is especially helpful in the southeast, where the soil is mostly composed of sand and lacks organic and mineral components.

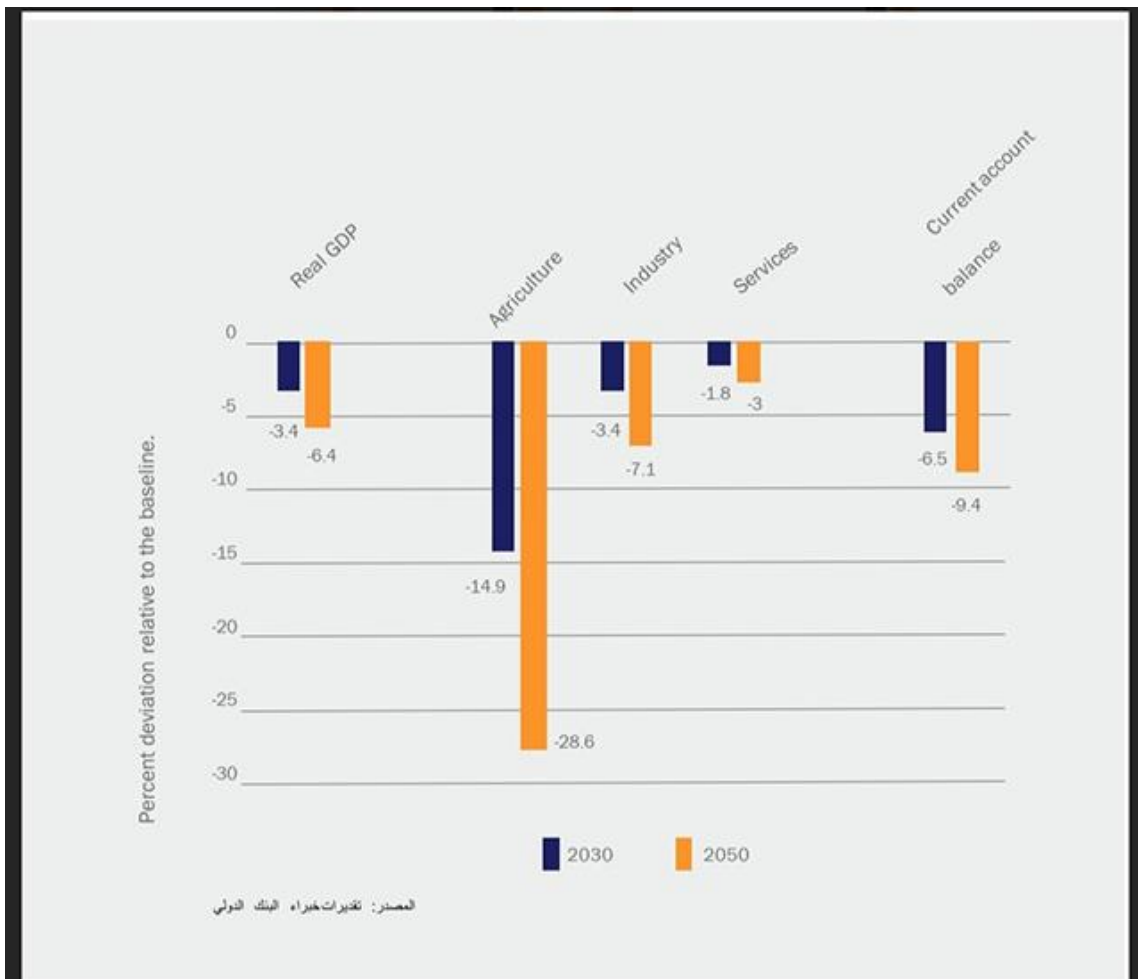
In addition, Mohamed al-Wassar emphasizes the importance of BSF fertilizer in improving soil quality and creating a more balanced environment. This fertilizer helps to concentrate irrigation water around the plant's roots, reducing seepage caused by sandy soil. As a result, farmers can use substantially less water for irrigation.



A photo of the fertilizer produced by Fawzia Mahdawi's project.

The potential for using this fertilizer goes beyond the southeast and extends to other areas of Tunisia, including the northwest. Both Mohamed al-Wassar and Fawzia Mahdawi agree that natural BSF fertilizer could be used in any region, as all soil types require organic materials. It may prove particularly beneficial in the northwest, where the soil is richer in nitrogen but has also been adversely affected by drought and climate change.

The effects of climate change on Tunisia have been worse in recent years. According to the World Bank's most recent report on development and climate in Tunisia, the Tunisian economy could decline by 3.4 percent of GDP by 2030 unless quick action is made to address the difficulties posed by climate change, including water scarcity.



A graph illustrating the predicted impact of climate change on the Tunisian economy.

In this context, climate expert Hamdi Hashad advised the Tunisian government to adopt a more comprehensive vision that is in line with the new geography caused by climate change. This involves putting local market demands ahead of exports and restructuring the agricultural map of different regions. The expert emphasized the urgency of this approach to mitigate the adverse effects of drought and climate change on the agricultural sector. He also emphasized the possibility of developing new crop types that are suited to this changing climatic setting, such as "mango" fruits.

Tunisia has responded by developing a national ecological transition strategy that focuses on five major areas: governance, funding, climate change, sustainable resource management, and ecosystem preservation, all while working to establish a green, blue, and circular economy.

How BSF farming projects for waste recycling contribute to the growth of the green and circular economies

According to Mohamed al-Wassar, BSF farming projects that recycle waste advance the green and circular economy. BSF larvae digest 7 to 10 tons of organic waste to generate one ton of natural fertilizer. Consequently, this approach to climate change adaptation plays a crucial role in reducing pollution by minimizing the need for landfill disposal methods. Furthermore, the fertilizer improves the soil and makes it easier to grow more trees, boosting the environment's ability to absorb damaging carbon dioxide.

In addition, he emphasized the importance of supporting projects that utilize this technology, advocating for the promotion of a more efficient environment, which includes adopting waste-sorting practices at the source.

The green, blue, and circular economy is emerging as a global trend, with numerous countries launching green finance initiatives to support environmentally sustainable businesses.

UN organizations, including the Food and Agriculture Organization of the United Nations (FAO), advocate for similar initiatives. For instance, in the Ivorian capital of Abidjan, they supported a renewed project that utilizes BSF to recycle waste and produce animal feed and cosmetic products.

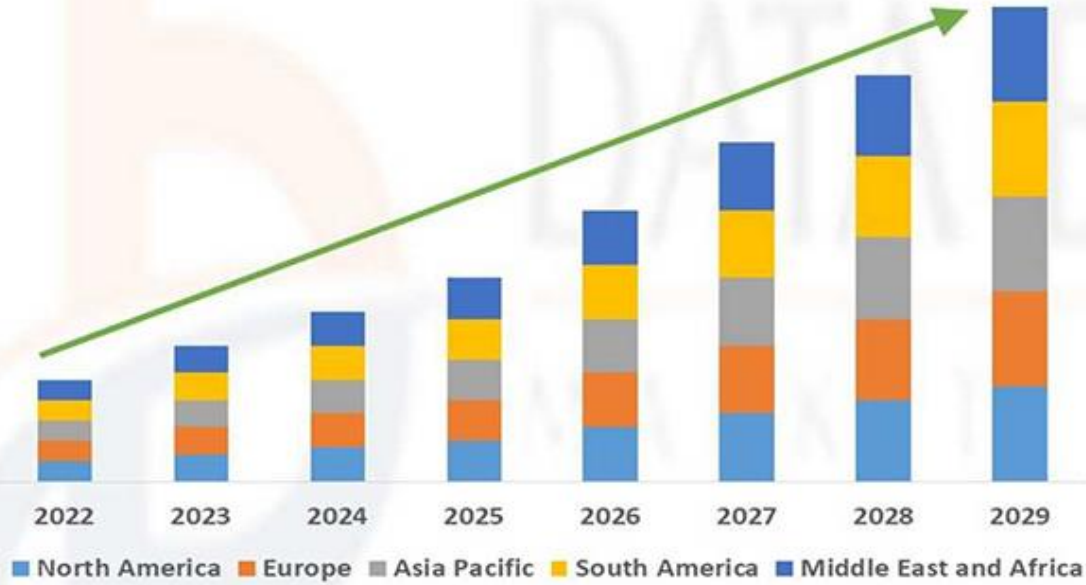


Le site de la ferme école d'Abobo Biabou ou se pratique l'élevage et transformation de larves dans le cadre du projet BioDAF. ©FAOCI.

A photo of a BSF project to recycle waste and produce fodder and cosmetic materials in Ivory Coast (Côte d'Ivoire)

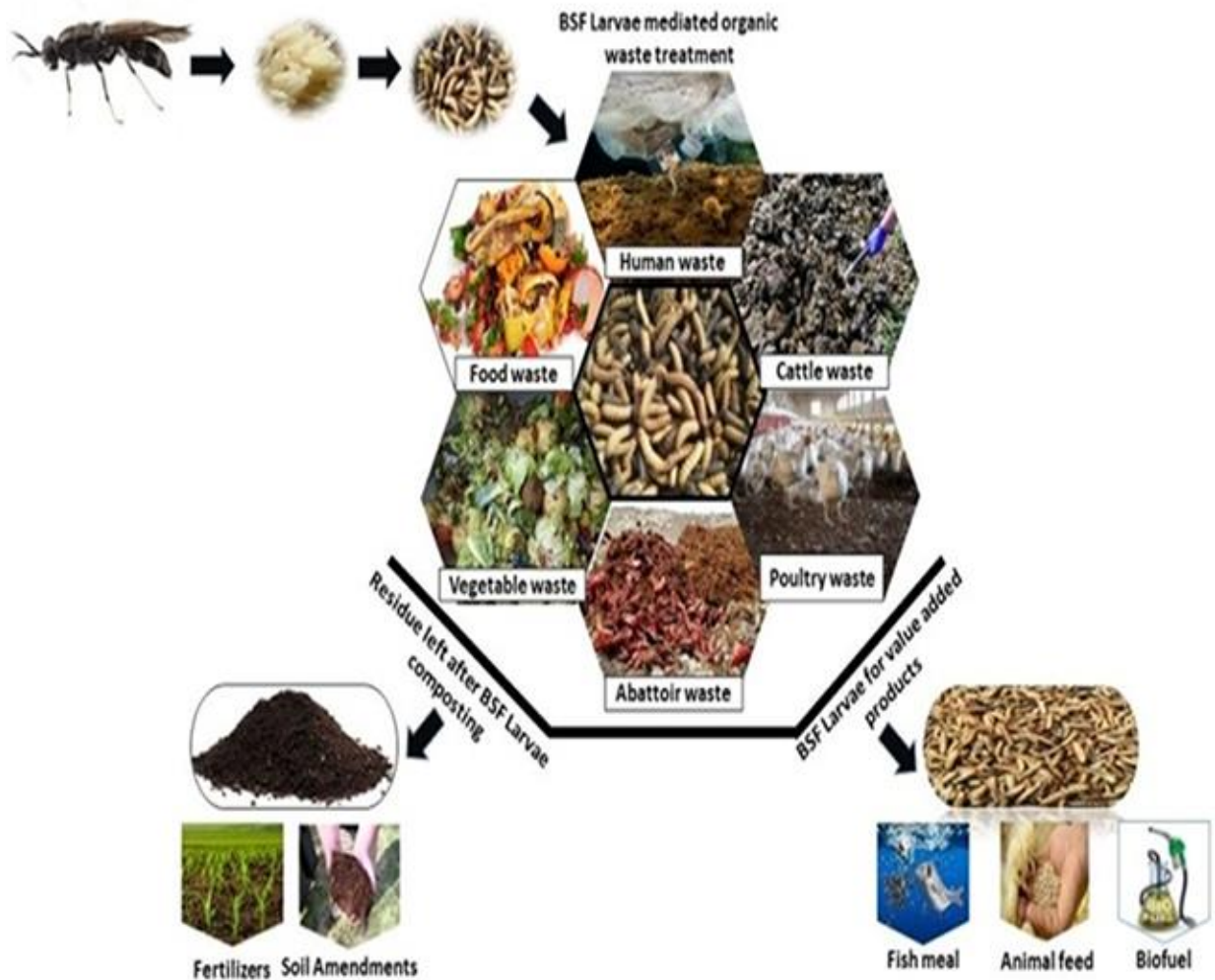
Furthermore, the global market for utilizing BSF in waste recycling and producing natural products—such as fertilizer, animal feed, and cosmetics—is expanding. The investment value in BSF-related products is projected to surpass 49 billion USD by 2029.

Global Black Soldier Fly Market is Expected to Account for USD 49.63 Billion by 2029



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The chart illustrates the increase in the global market investment value in black soldier flies (BSF) products.



The process of transforming organic waste into natural products through the use of black soldier flies (BSF).

These potential opportunities have inspired Fawzia to expand her project. In addition to producing fertilizer, she is now exploring the possibility of using BSF to recycle organic waste into cosmetic oils and protein-rich flour for animal feed.

BSF are harmless to humans, making them an excellent choice for eco-friendly projects. This strategy could assist shift away from traditional garbage disposal methods like landfilling and burning, which have negative health and environmental consequences.

On the other hand, investing in this green technology encounters several challenges, particularly the lack of adequate knowledge about the black soldier fly. Fawzia notes that she “frequently has to explain what this insect is and how it differs from the common fly.”

Another challenge she faced at the outset of her project was securing funding; however, this did not deter her from pursuing her goals after enhancing her project management skills through training and support.

The American Chemical Society has published various scientific research studies on the use of black soldier flies for recycling waste and transforming it into a range of natural products. Some of these studies emphasize the need for further development of this technology to leverage advancements in scientific research in this field.

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