

Revealing the secret cocoa pollinators

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Landscapes in Central Sulawesi, Indonesia, dominated by cocoa plantations.
Credit: Manuel Toledo

The importance of pollinators to ensure successful harvests and thus global food security is widely acknowledged. However, the specific pollinators for many major crops—such as cocoa—haven't yet been identified, and there remain many questions about sustainability, conservation and plantation management to enhance their populations and, thereby, pollination services. Now, an international research team

based in Central Sulawesi, Indonesia and led by the University of Göttingen has found that ants and flies—but not ceratopogonid midges, as was previously thought, appear to have a crucial role to play. In addition, they found that promoting biodiversity-friendly landscapes, leaf-litter and trees providing shade in agroforestry systems can enhance tiny cocoa pollinators. The research was published in *Biological Conservation*.

The team, in collaboration with Tadulako University in Palu, carried out two [separate experiments](#) involving 42 cocoa agroforestry farms in the Napu Valley of Central Sulawesi. The work included applying a sticky glue to over 15,000 flowers in more than 500 trees for an eight-month period and recording the identity and abundance of captured flower visitors. In one experiment involving 18 farms, they investigated the effect of the distance between the forest and the [farm](#), and the amount of canopy cover from shade trees on the abundance of the main pollinators. In the second experiment in 24 cocoa farms, they measured the effect of leaf-litter management on pollinators. In both experiments they quantified the amount of forest and agroforests surrounding the 42 cocoa farms.



Cocoa flowers depend on insects for pollination so that cocoa fruits can form.
Credit: Manuel Toledo

The researchers found that ants were the most common flower visitors. This highlighted their potential as pollinators, whether directly (by transporting pollen), or indirectly (by disturbing pollinators and promoting their movement). The study also shows that preserving biodiversity-friendly landscapes, such as forests and agroforests, and promoting agroforestry systems is crucial for pollinator conservation. This in turn promotes pollination and sustainable cocoa production.



Cocoa flower visited by a tiny parasitic wasp. Credit: Manuel Toledo

"We were surprised that we did not capture any cerato-pogonid midges, even though these tiny midges were considered the most important pollinators of cocoa. This emphasizes that cocoa pollinators are more diverse than previously known, but also that there is still much to learn," said Dr. Manuel Toledo-Hernández from the University of Göttingen and first author of the study. "Current global [cocoa](#) initiatives should consider the role of biodiversity friendly habitats for the conservation of pollinators, because their pollination services are an ecological alternative towards current commitments on combining [high yields](#) with conservation," added Toledo-Hernández and his coauthors Teja Tschardt and Thomas C. Wanger.

More information: Manuel Toledo-Hernández et al, Landscape and farm-level management for conservation of potential pollinators in

Indonesian cocoa agroforests, *Biological Conservation* (2021). [DOI: 10.1016/j.biocon.2021.109106](https://doi.org/10.1016/j.biocon.2021.109106)

Provided by University of Göttingen

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