Unmanned aerial vehicles (UAV) turn monitoring of tropical forest recovery cheaper

Due to stringent conservation measures in the tropics, large areas of exploited forest lands are in the process of restoration in order to achieve the conservation goals. However, monitoring of the restoration activities and conservation methods adapted is highly hindered because of the investment cost and poor accessibility to the study areas. To circumvent this, the possibility of utilizing inexpensive drones to estimate field measures has been discussed. Researchers suggest that through automated monitoring process it is possible to get equally accurate data coupled with a reduction in estimation time and investment cost.

The world witnessed a large clearing of tropical forests for promoting agriculture between the years 1980 - 2000. Later, on realizing their importance in ecosystem functioning and after the harsh effects of climate change, most of the exploited areas are brought under restoration. It is also equally important to monitor the conservation efforts followed to ensure that these areas are replenished with the right vegetation. There are many drivers for conservation efforts, including governmental subsidies, and many of the people implementing the projects are individual land owners. Monitoring regeneration can be labour intensive and expensive, making it difficult to know whether conservation efforts have been successful. Under these conditions, a new initiative by a group of scientists has tested the utility of unmanned aerial vehicles (UAV) or drones for monitoring forest management, thereby making monitoring a cost-effective.

Traditionally, manual monitoring of rainforest regeneration involves technical people and specialist equipment, and also very challenging in remote areas. Later as an alternative to manual monitoring, LiDAR (Light Detection and Ranging) was introduced. This technology was based on remote sensing that analyzes reflected light. But, a single LiDAR flight to monitor forest recovery remotely can cost upwards of $20,000. Recently, Dr. Zahawi from Organization for Tropical Studies and his team, including researchers from the University of Maryland and the University of California-Santa Cruz, USA, tested a new approach to monitoring that doesn't involve manual intervention. Using inexpensive drone-based remote sensing technology, they measured the structure of forest canopy across a series of 1-hectare regenerating in southern Costa Rica. The land is part of a long-term tropical forest restoration study.

Image of UAV used for monitoring forest recovery *(Courtesy: Dr. Zahawi)*

One of the major advantages of deploying drones to monitor forest regeneration is that they will reduce the costs associated with conservation projects to a greater extent. The research team developed an inexpensive Unmanned Aerial Vehicle (UAV)-based remote sensing technology known

as ‘Ecosynth’ to monitor forest restoration. In simple, the drones employed in these models were fitted with a simple 10 megapixel point-and-shoot digital camera and use open-source software to process these overlapping images. The camera takes thousands of photos and the "Ecosynth" methodology then creates 3D images called point clouds that represent the vegetation. In total, the drone and camera cost US$1500 -- less than a tenth the cost of some equivalent flights.

The results produced by Ecosynth for various parameters such as canopy height, above ground biomass and canopy structure (whether the canopy was rough or open) were compared to field-based measures. The research team also evaluated whether UAV-measured canopy height could predict the abundance of fruit-eating birds (frugivores) as accurately as field-based height measures; many fruit-eating birds, such as the mountain thrush, black guan and sooty-capped bush tanager, are important for forest regeneration. All these investigations clearly indicated that Ecosynth was as accurate as human monitoring, except few errors when the canopy was low.

The researchers suggested that it requires still some time to optimize Ecosynth and make sure the data taken and image captured are accurate under all conditions. “Whatever may be, but the approach has real promise in monitoring regeneration. Also, application of UAVs will result in more people monitoring their land in the tropics, giving us better information about what works and what doesn't” concluded Dr. Zahawi.

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