

EYES IN THE SKY, EYES ON THE GROUND

IMAGINE THIS SCENARIO: Using thermal imaging, a ground sensor notices an unusual heat signature at the edge of one of Cargill's Indonesian palm oil plantations. An operator in the control room many miles away checks the feed, switches to video and sees a plume of smoke rising over the forest. Minutes later, a drone is launched to beam back high-definition video of the scene. Using maps of the area, the operator can see exactly what is going on and swiftly notify local authorities of illegal burning.

Such up-to-the-minute remote monitoring of palm plantations to curb deforestation was once just a dream. At Cargill, it may soon become reality.

Most people are familiar with drones' military uses, and civilian applications—perhaps most notably in agriculture—are becoming more common by the day. Now Cargill is piloting a network of sensors in the air and on the ground that, if all goes well, will lead to more sustainable palm oil production. But just as important as the technology will be the people behind it.

"I feel proud to be given the opportunity to be a drone pilot," said Budhi Pramono, a geographic information systems assistant from Cargill's PT Hindoli palm oil plantation in Indonesia. He is one of eight people who gathered in Sandakan, Malaysia, recently to be trained as certified drone operators. "This is a big step forward for us as a company," Budhi said.

After two days of classroom instruction, the prospective pilots went out to the airfield—actually an out of the way horse racing track—to earn their wings. Though he had previously piloted quadcopter drones, Budhi admitted that he had sweaty palms when he geared up for his first fixed wing drone flight. As his colleague launched the plane, throwing it over his shoulder, Budhi gave full throttle. "Within a few seconds, the drone was at an altitude of 100 meters and it was time to switch to autopilot," he said.





At its palm oil plantations in Indonesia, Cargill is introducing drones and ground-based sensors to help prevent deforestation.

BY TOM VANDYCK
PHOTOS BY ARIF ARIADI

During a training session in Malaysia, Cargill employees learned how to fly drones that can be used to monitor for deforestation around the company's palm oil plantations in Indonesia.



Though nerve-racking at times, guiding the six foot long, battery-powered drone through the sky was a lot of fun for these trainees. Still, there were rigorous procedures to be learned. The prospective pilots had techniques and terminology to master. They learned how to plan and fly a mission, and process the data after landing.

"It's a combination of flying skills, electronics knowledge, photographic techniques and geographical information gathering," said Budhi. "You have to understand all of them to be able to conduct a mission."

Keeping an eye on the land

Cargill's remote monitoring pilot program not only depends on what's in the sky, but also what's on the ground. While the drones are buzzing around in the air, an array of shoebox-sized network cells equipped with electronic sensors, mounted on tall poles and outfitted with solar panels and satellite linkups, will keep an eye on the hundreds of rows of tightly packed oil palm trees and the surrounding jungle. Tied together by powerful software, they will form a tightly knit network that has the potential to give plantation managers a much better idea of what's going on with their land.

"The thermal cameras give us the opportunity to get boots on the ground at the first sign of trouble," said Senior Director of Sustainability Steve Polski, who coordinated the launch of the project from Cargill's Minneapolis headquarters. "And with the drones, you can get real-time information in the air."

That information is collected on a local network and transferred to a local control center, from where it can be made accessible to Cargill personnel around the world.

"We always talk about transparency, traceability and being accountable for what we do," said John Hartmann, chief executive officer of Cargill Tropical Palm. "So we're working on multiple fronts to fulfill those commitments, and this program may prove to be a very effective tool in curbing deforestation."

The system's promise goes far beyond identifying illegal activity. In fact, most of the time, the sensors will be used for the tedious work of cataloging the landscape. That's why the first order of

business for Cargill's prospective pilots was learning procedures to find and map out High Conservation Value and High Carbon Stock tracts of forest—the very pieces of land that the company has committed to protecting in its 2014 sustainable palm oil policy.

Using the skills that they learn during training, Cargill's drone pilots will map the land at the company's newly acquired Poliplant plantation in the Indonesian province of West Kalimantan. The drones will fly in well-defined patterns, snapping high resolution pictures of what's beneath them. Later, a computer will stitch together the images and produce a detailed map of the High Conservation Value and High Carbon Stock areas.

The effort will help bring the new plantation in line with Cargill's sustainability commitments.

"That's a big job," said Colin Lee, director of Corporate Affairs for Cargill Tropical Palm, who coordinates the monitoring program. "We also have a lot of work to do with employees, smallholder farmers and simply the business of running the plantation. The drones and sensors could make it much easier for us to map and monitor sensitive areas."

Singapore-based Double Helix Tracking Technologies is the consulting firm that supplied Cargill with the drones and is providing the pilot training.

"You'll have a very transparent record of your operation that shows exactly how you're meeting your environmental commitments," said Max Horowitz-Burdick, project development manager at Double Helix. "It's visual proof that you can take to anyone and say, 'Look, this is how we're operating.'"

A boon for the environment

With the satellites that were used for most forest monitoring up to this point, Cargill would see a picture of a patch of land, and if three months later a bunch of trees had suddenly gone missing from the frame, the company knew something was awry. Drones can make the process a lot quicker, less expensive and more precise.

"Using satellites requires a lot more time and money," said Lee. "First, you need to instruct a company to maneuver a satellite over



Prospective pilots learned the basics of drone operations: flying the planes, mapping the land and processing the data. They also spent hands-on time in the field learning how to fly the drones.

the area where you want to capture an image. They typically charge you for a specific date and time, and if the satellite's over the area and there are clouds, too bad—you pay anyway.”

On the ground, the solar-powered, satellite-linked sensors can keep an eye on everything from illegal burning and theft to soil conditions and irrigation.

“There are fires, equipment occasionally gets stolen and there are people who are going on our plantations to steal fresh palm fruit bunches and then turn around and sell them right back to us,” said Polski. “Better monitoring is good for the environment and it’s good for business.”

As an added bonus, some strategically chosen sensor cells can serve as internet hot spots around the plantations. Thanks to the pilot program, Poliplant’s existing network was upgraded and connected to Cargill’s technology infrastructure in just two weeks. That was a feat that was unheard of in the Indonesian palm oil industry, where plantations are often in hard-to-reach places and such efforts used to take months. Now, Poliplant employees can get online without much effort and smallholders will be able to use the network to conduct their business and exchange best practices.

Ultimately, the technology should also benefit yields. Like any crop, oil palm trees depend on water, sunshine and soil conditions—variables that will be monitored by the new sensors.

“This way you can predict what your crops need,” said Yogi Sookhu, founder of Gotham Analytics, the New Jersey-based firm that provided the sensors for the pilot program. “If any of the variables change, you can make adjustments immediately. You’ll have advance notice of what your yield could be. Knowing that, you can plan for transportation and storage. If it’s going to be a better year than expected, you know how to manage your resources.”

In a world where populations are growing and living standards are rising, higher yields are a boon for the environment. If you can grow more on the same amount of land, it’s easier to protect forests, because you simply don’t need as much new land.

“Palm will yield four times a year,” said Sookhu. “It’s in constant harvest. So if you’re not looking at soil erosion, fertilizer

and proper usage of water, you’re missing a big part of the whole sustainability story.”

A telling example is the tide gate at Cargill’s PT STAL plantation in South Sumatra. The gate used to be hand-cranked, but now it’s motorized and hooked up to a soil moisture sensor. “If the sensor finds that the water has fallen below 80 percent, it will automatically open the gate,” Lee explained. “So we get more accurate control of our water levels. With this technology, we could precision engineer our palm plantations.”

Set for a boom

The early work with the drones and sensors shows great promise, said Cargill’s Hartmann. “It’s a complex job and there’s a lot of work still to be done, but we envision this technology really helping our work along. At the same time, as good a data gathering tool as this can be, you’ve got to remember it’s only a tool. Drones and sensors alone don’t equal sustainability. What matters is how you translate the data into actions on the ground.”

“High-tech remote data-gathering is set for a boom,” said Dave McLaughlin, vice president for agriculture at World Wildlife Fund. WWF, too, now flies drones to combat illegal logging and poaching in places like Nepal and Africa. McLaughlin believes that the new technology will make it easier for Cargill to work sustainably and be transparent.

“Cargill has just made zero deforestation commitments in palm oil, so monitoring what happens in those plantations is going to be more and more important,” said McLaughlin. “Drones are a pretty inexpensive and extremely accurate way to do that in real time.”

Back at the Malaysian race track, Budhi Pramono was getting ready to land his drone. “This is the most frightening moment for us as beginners,” he said. “You have to go from autopilot back to manual mode, keep the plane steady, reduce altitude continuously, fly straight to the track and, most importantly, land right on target.”

With the help of this new technology, Cargill is one step closer to landing on its target: a sustainable, deforestation-free palm oil supply chain. ■