Drones Really Can Pollinate your Tomatoes and Strawberries

While we hear plenty about bees and butterflies pollinating fruits and vegetables, those insects don't pollinate crops in vertical farms or greenhouses. Polybee has a solution, using tiny drones to pollinate crops so farmers can get fruits and vegetables to market.

Solving the Problem of Pollination

"Vertical farming companies are trying to grow food crops indoors," Polybee founder Siddharth Jadhav explained, "but there is no solution for pollination." When he reached out to vertical farms in Singapore and abroad to ask about drones, "surprisingly, everyone started getting back to me and said, 'it's a real problem.' That was validation of the problem statement, because they had no business responding to this person who doesn't even have a company yet."

His path to drones for pollination was itself serendipitous. As a researcher at the National University of Singapore, he had nothing to do with agriculture until 2018. When he was encouraged to explore the commercial potential of his research on drones, conversations about food security piqued his curiosity. "I realised that the problem of pollination is not just indoor farming. It's broader, adjacent sectors, greenhouse agriculture and orchard crops."

He soon realised that another problem is forecasting when crops will be ready to harvest. While farmers want to promise volumes to retailers so they can maximise their revenue, harvest timing estimates are based purely on hunch and judgment.

"The main reason we chose these two applications," Siddharth said, "is because they have a big impact on profitability and productivity. Consumers have a more reliable supply chain, and growers have higher profits."

The environmental impact is somewhat indirect. While Polybee is not directly targeting reduction of greenhouse gas emissions, higher productivity through pollination and less wastage when sales are timed better can reduce farmers' carbon footprints.

Target Customers

While vertical farms and greenhouses are the primary targets, Siddharth said Polybee also works with plant breeding (seed) companies. "Breeding is changing very fast because of climate change. The cycles are about five to seven years. What you're aiming for today might not even work by the time it is out there."

To speed up seed development, Polybee uses digital phenotyping - using digital tools to evaluate seed performance. "They use our solution to measure performance and reduce breeding timelines. We are enabling companies to address famine and disease faster."

"A kilogram of tomato seeds costs more than €60,000," Siddharth said. It's more expensive than gold. Plant breeding companies invest a lot to develop those varieties. Technologies I put in can help them do it better." Along with seeds for indoor crops, he said it could eventually be outdoors too.

"It's very important to make sure the business model is proven and the return on investment is clear for growers," Siddharth said. "Sometimes that can take time because in agriculture, you're bound by crop cycles." When he goes to growers, he wants to be able to tell them they will get a 3X return.

How it Works

"We collect imagery or video data on farms using a smartphone camera or a drone," Siddharth said. "We use our computer vision and AI to extract measurements on the flowers.

The goal is to forecast yield two weeks in advance for fruit crops like tomatoes and strawberries. Currently, however, forecasts even three to four days in advance may not be

exact. Even so, he said “whatever ‘heads up’ you get is better than their existing way of doing things.”

There are Few Competitors

Polybee is by no means the first company to develop a solution for pollination, Siddharth said, However, “there are no direct competitors that we know of except maybe one company from China, which uses a different approach.”

There are also companies which look at orchard crops such as apples or pistachios, though they are different. “These are cross-pollinating crops. We work on self-pollinating crops which collect pollen, store it and then disperse it.”

The competitive landscape for forecasting is busier, he said. Most companies have been using historical data to make forecasts. However, “we are increasingly seeing similar approaches to ours. He is now looking at understanding the relationship between images and the weather, whereas the other companies are doing it the other way around.

There is also a difference in the go-to-market strategy, Siddharth said. “We are specific about greenhouse agriculture. It is where natural pollinators are least equipped to perform. There's only one pollinator that can work inhouse, bumblebees. You can't use honeybees in greenhouse because cannot easily navigate an environment without UV. We are not looking at crops grown outdoors yet.”

Marketing Methods are Expanding

To reach potential clients in the early days, Siddharth said, Polybee primarily used messages on LinkedIn or emails.

As Polybee expands and continues to scale its technology, Siddharth said it will develop marketing channels. “We’re looking at partnerships. We have been working with input companies. We're engaging with one of the leading companies in the world to commercialise our solution.”

He also wants to work with associations and cooperatives. “We've done some of that in regions like Western Europe, Australia. You do a pilot with a grower. The association or the coop publishes the results and lets everyone know.”

The Revenue Opportunity is Huge

Polybee raised S$100,000 in a pre-seed round, then raised a non-dilutive round from Temasek Foundation of about S$730,000. It also started paid pilots. To grow further, it raised US$2.1 million in a seed round led by Elevate VC and Seeds Capital, and it received funds from Horticulture Innovation Australia. It is not raising further funds now, though towards the end of the year it will look at the best way to accelerate growth.

In the long term, he said, the market seems huge. “This is a billion-dollar addressable market,” he said. “We've selected a few crops to target in the near term - greenhouse crops, berries and tomatoes. We’re also looking at open field crops such as leafy greens. We look at the value on a per unit area basis, how that multiplies across different regions, the ones we can access.”

The Impact is Personally Satisfying

As he reflected on his personal goals, Siddharth said “it's a humbling industry.” “You learn so much every day. My personal ambition is to maximise the impact of technology in the sector, applying newer technologies like drones, AI, and computer vision in agriculture. We're only scratching the surface. It will continue to fuel me as long as I see more potential. I know how growers’ businesses can be important, and that really is the North Star.”