

Polli-Tech - Autonomous Drone Pollination for a Bee-Safe Future

Within the past years, Ontario has been facing significant issues with its ecological and agricultural environment. To explain, the Ontario Beekeepers Association has reported roughly 50% of bee colonies dying in the recent winter of 2023 to 2024, horrifying numbers which will continue to get worse. Major concerns are rising as this number is beyond the sustainable amount, which is only 15%, portraying how horrifying the situation is. In addition, the beekeepers in Ontario lose about 40-60% of their hives each year, and it is really hard to "replace" them constantly. If there is no rapid change, the bee industry will face major consequences, possibly resulting in pollination services ceasing to exist within the next decade. If this were to occur, the domino effect would impact other aspects of food systems, causing irreparable damage.

To put it into perspective, pollinators are roughly responsible for seven billion dollars worth of Canadian agricultural production yearly. This includes various crops (e.g. apples, blueberries, cucumbers, etc), all of which require bees to help them reproduce. Statistics show that in Ontario, 75% of crops require pollinators; they cannot survive without them. In other words, without pollinators, 3/4th of the crops in Ontario would cease to exist, a major number that the province cannot afford to risk. The decline of bees not only affects crops but also the financial well-being of residents. To explain, when bee populations crash, the farmers lose a tremendous amount of their crops, which means they mark up the prices of the remaining crops, roughly by 15-30%. The city of Brampton contains 62% of agricultural farmland, one of the best in Canada. The York Region contributes \$3.8 billion yearly to support these food sectors, along

with providing 67,000 jobs, all of which can be affected as they depend on pollinated crops. If the bee population does not rise soon, the economy itself will be in trouble (grocery stores and people's jobs). Fortunately, Brampton has 19 community gardens, designed to make the city more sustainable. They also have a goal of a five-year pollinator garden, which cannot succeed without pollinators. To make matters worse, about 35% of native bees in North America are facing extinction, which is largely due to urbanization. What this means is that there is an urgency to bring restoration, even if it may take a couple of decades to recover.

This is where Polli-Tech comes in. Our project is aimed at an autonomous drone pollination system that performs the work of a bee. Simply, we are creating robotic bees to replace the drastic decline in bee populations until they recover. With the usage of AI computer vision, our drones will locate flowers and analyze them, targeting to pollinate crops which lack it. We will implement the usage of heat maps, which basically indicate areas in the Peel Region that have low vegetation. By comparing the current year's heat map and the previous one, we will know which areas are undergoing more significant vegetation loss. Additionally, our drones are designed not to disrupt actual pollinators as well, doing the task they need to do without disturbing wildlife. As stated, our goal is not to replace nature; it is to buy enough time for the bee population to recover while we sustain the environment. Polli-Tech promises to protect thousands of jobs, whilst also maintaining Ontario's \$7 billion agricultural economy. This project will take time, but with effort and patience, it will succeed.