In the past year, we have seen more robots, drones, and Silicon Valley technology start-ups tackle some of the industry’s greatest dilemmas than ever before.

Before we get too far ahead of ourselves, understand this: Robotics still have quite a ways to go before they can be used in practical applications. Whether they are sorting, pruning, or using advanced sensors to harvest and pick crops, robots have indeed brought a new technological dimension to farming. So how long will it be until we see machines with mechanized claws for hands, cameras for eyes, and tank treads for feet roaming the fields?

To understand more, I spoke with Dr. Jan Bontsema, a Senior Scientist in the Netherlands’ Wageningen University & Research Center and one of the lead researchers for CROPS, or “Clever Robots for Crops,” a large-scale project funded by the European Union dedicated to working on automation and robotics for sustainable crop and forestry management.

“There’s a huge market for robotics in greenhouses,” Dr. Bontsema tells me. “In the Netherlands, sorting, packing—it’s already automated. Harvesting is the next big thing. Most people working in Dutch greenhouses come from Poland and Romania. There would be no problem if they would immigrate to the Netherlands, but it’s not considered sustainable for the growers.”

This presented a unique challenge to Dr. Bontsema and the team of researchers and scientists that compose the CROPS partners, which include fourteen different labs and research centers across ten countries in Europe. The CROPS robotic platform has been developed and demonstrated for high-value crops,
Including greenhouse vegetables, fruits in orchards, and grapes for premium wines. Since its inception in 2010, the CROPS team has developed an apple harvesting robot, a close range precision spraying robot, a canopy optimized spraying robot, and the world’s first working sweet-pepper harvesting robot.

“We first experimented with the sweet-pepper harvesting robot in a real greenhouse with a commercial grower in April 2012. That was the first time in the world that a robot was demonstrated in a real greenhouse,” Dr. Bontsema tells me. “We proved that the system can harvest ripe fruits fully autonomously.”

Using sophisticated 3-D cameras, the robot can evaluate the size, color development, and ripeness of the peppers, and ultimately detect whether they’re ready for harvest. After the cameras calculate the position of the fruit and translate that information to a robotic gripper, an integrated cutting tool with fingers can approach the fruit from below to detach the pepper from the plant. One robot can cover 1.4 hectares of a modern Dutch sweet-pepper greenhouse.

If you thought that harvesting was amazing enough, think again. The researchers identified a number of potential field assignments the robot could complete autonomously in the greenhouse, including monitoring, planting, pruning, and tying up the

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plant. A mobile platform that can move between plant rows is currently under development, providing opportunities for monitoring. The other tasks are most likely not economically feasible to automate.

Developing an ambitious platform such as a sweet-pepper harvesting robot is no easy task, however. There are several variables that need to be accounted for, and these are some of the biggest hurdles researchers like Dr. Bontsema must face.

“Our greatest challenge is the reliability of the system. There are always things that don’t work perfectly in practice,” Dr. Bontsema explains. “If it becomes too hot in the greenhouse, there is a possibility that the robot arm will fail. It’s a difficult task for a robot to harvest in a greenhouse and agriculture in general. It’s an unstructured environment.”

Compared to manual harvesting, the sweet-pepper harvesting robot will be profitable once the price of one robot is below €195,000 (approximately $210,000 U.S.) with a cycle time of six seconds for each harvested product and at an economic and technical life cycle of five years. Manual harvesting takes about four seconds per fruit, while the current robot has a cycle time of 94 seconds per fruit.

There is an incredible amount of potential on the line, and it’s clear that robotics have a place in our industry no matter if they are in a greenhouse, in the fields, or on an orchard. All it takes is a bit more time and investment, and maybe a little luck.

“I think we can manage to get more reliable robotics in the near future, especially with the advanced technology we have seen and used in recent years,” Dr. Bontsema tells me. “I hope that we can continue to make more robots.”

CROPS currently has a follow-up project funded by the European Union called SWEPER, which starts in 2015 and ends in 2018. The project involves six partners from four different countries, including the Netherlands, Belgium, Sweden, and Israel to introduce, test, and validate a robotic harvesting solution for sweet peppers under real-world conditions.

Even in their infancy, these marvels of engineering have several promising applications, potentially bringing vast improvements to an age-old practice. We are just witnessing the beginning of something that is already changing the dynamic of agriculture forever.