CAROLYN DE LA PEÑA

Thinking Through the Tomato Harvester

If you've driven the highways and back roads of the Central and Sacramento Valleys in the summer, when the tomatoes are at their ripest, you may have seen them. And maybe like me, the first time you saw them you had to stop and watch for a while. It's difficult not to be mesmerized by the strangeness of a tomato harvesting machine. "Factories in the field" is what some scholars have called them, and it's easy to see why.

The most visible component of the harvester is the men and women on its sorting crew, who work on each side of the machine, almost as if they're on a stationary assembly line. Yet the machine itself is constantly moving. Up and down the rows of tomato plants it travels, pulling with its giant blade whole tomato plants into its body, shaking them to free fruit from vine, tossing the vine back out into the field while pushing the fruit up onto conveyor belts, where human hands and machine processes merge as the sorters quickly separate bad fruit (along with the occasional snake or mouse) from good fruit, allowing only the good to move into waiting bins that will eventually be transported to processing plants.

The individual elements of the harvester seem incongruous. The object, as a whole, appears unstable. And yet, somehow, it achieves something that is difficult to imagine. It pulls ripe tomato plants from the earth, subjects them to blades, shakers, conveyor belts, and metal bins, and, at the end of this violent process, delivers not field-made gazpacho—but piles of ripe, intact, harvested tomatoes.

There are many stories we could tell about the harvester and its impact on California agriculture, California eating habits, and California's farm labor. One of them would explain how it displaced thousands of mostly Mexican-American farm laborers in the 1960s, and then became the subject of a major lawsuit against the University of California, ultimately resulting in a new ethos of worker-impact-centered agricultural research on our campuses. Another would illuminate the lightning-fast implementation of the machines and the rapid changes they brought to farming and consumer practices.

In 1963 about one percent of California's industrial tomato harvest was picked by about 60 machines. By 1968, there were over 1,450 machines across the state delivering 95 percent. Almost as quickly, tomato growing shifted geographies, moving

Boom: A Journal of California, Vol. 3, Number 1, pps 34–40, ISSN 2153-8018, electronic ISSN 2153-764X.

DOI: 10.1525/boom.2013.3.2.34.

from the small fields of the Sacramento Delta and the Davis/Woodland/Sacramento region to towns around Fresno, in order to find the flat land and consistent irrigation possibilities required by the machine.

With its price tag reaching $200,000, the farmer using the harvester needed higher tomato acreages. Small side-line tomato farmers were pushed out and mega-farms moved in. Farmers in search of higher yields layered on new pesticides, beefed up irrigation, and eliminated competing crops. The proliferation of tomatoes for processing enabled food companies to produce cheap sauces, catsups, and pastes. These things, in turn, fueled the ever-expanding industry of fast and convenience foods.

Still, watching a harvester in motion, it's difficult to avoid pondering the machine itself. And this is good. We should spend time thinking about the machines that have industrialized our food supply and displaced field labor in California. Thanks to the work of scholars like Deborah Fitzgerald, Julie Guthman, and Michael Pollan, we understand that industrialized agriculture has had negative environmental, human, and health consequences. Matt Garcia and William Friedland explore in depth the devastation mechanization brought to farm worker families across the state. These are important stories of consequences. Still they do not fully illuminate the human motivations that created the objects—like the harvester—which enabled our agricultural systems in the first place. This can more easily come into view if we study the machines. If we want to create a better agricultural system we need not only to advocate for what we want; we need to also understand the human motivations that delivered what we have to us. Tomatoes, it turns out, have not been the only things made in these fields.

Building the Machine and the Tomato

When UC Davis seed specialist Jack Hanna began to work with aeronautical engineer Coby Lorenzen in 1949 to create a machine that could pick and sort tomatoes, no one seems to have thought they would succeed. As one professor who worked with them during those years put it, the two men were "kind of the laughing stock around here" for nearly a decade.[1] The main problem was the tomato. While varieties could be easily manipulated through seed selection and cross-breeding, no tomato existed that could withstand the violence of mechanized cutting, separating, sorting, and loading. Hanna, a vegetable crops researcher with previous

experience in asparagus crops, spent years traveling the US, exploring variations on tomato seeds, creating new hybrids, and raising the seeds to plants, only to fail time and time again when the fruits came into contact with Lorenzen's prototype harvesting machines. Some tomatoes were too soft, and squished on contact with the cutting blades that detached the stalks from the ground just below the soil. Others were too fixed on the vine, and refused to separate when pulled into the machine's internal shaker, turning to sauce instead. Even when a tomato could make it through those rigors, it failed to move regularly up the conveyor belt, or its skin thickness wasn't quite sufficient to withstand the eventual hurl off the harvester into the tight compression of waiting bins. Well into the 1950s, few people took their efforts seriously. They had limited funds, no research assistance, and an industry that in spite of rumblings about the end of the Bracero Program, did not yet prioritize a push to develop tools for automation. For colleagues at UC Davis, the repeated attempts and failures continued to be "highly amusing."[2]

It's hard to know exactly what kept Hanna and Lorenzen working through these apparently insurmountable problems. One thing we do know is that both of them were fascinated by the requirement that they think about tomatoes *through the machine*. Historical evidence lets us imagine what the two might have experienced on one of their typical annual road trips to El Centro to test the latest model harvester in a field of experimental tomatoes. The date might have been 1956. Hanna, after six months of hybrid seed development and months of waiting for the plants to mature, has just watched the latest prototype fail with each of the varieties. Some tomatoes refused to separate from the stem. Others smashed on contact. Others made it through the process, only to collapse under the weight of their fellow fruit in the bins. Lorenzen, an aeronautical engineer by training, has just watched his machine, perhaps his eighth or ninth prototype, liquify the fruit. It's a long drive back to Davis. Nevertheless, Hanna remembered years later, that these drives—with hours on the road and nothing to distract them—was when their most fruitful collaborative thinking

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took place. They'd analyze the problem, reconsider the plants and the machine process, and come up with their next set of modifications. Gradually, as the years passed, Hanna knew nearly as much about the machine as Lorenzen did. He understood the limits of what the machine could do in the field, and, with this machine perspective, set about finding the fruit that could succeed. The key was a change in perspective. Instead of looking for flavor, texture, or even color or appearance, as he would have otherwise, he had in this project to learn to "look at a plant mechanically." Flavor, liquid content, shape, and appearance were secondary to finding the properties that could be run successfully through the harvester. For Lorenzen, who in 1949 knew "nothing about tomatoes," exchanges with Hanna, and years of watching tomatoes, allowed him to build machines that bent ever closer to the specifications of nature. In 1959 the team at last discovered, in tandem, a tomato whose thicker skin and oval shape could survive an automated harvest *and* a machine that could pick it. Called the vf-145 (sometimes referred to as the "square tomato"), this valuable seed proved that an unlikely and imperfect collaboration had finally blossomed.

Learning to Master the Machine

If the tomato was the puzzle for the engineer and plant hunter to solve, the machine was the puzzle for the grower. In the early years of production, the harvester broke down almost as often as it ran. First, there was the night before its big debut, when journalists and growers from all over the state were invited to see the harvester process the vf-145 on a real farm near Davis. One of the conveyors broke, and no one had a replacement part, and, as one machinist on the scene recalled, "it didn't matter who you were, you jumped in with a monkey wrench" to get it going again. In the first year of the machine's mass production, nearly all of them had to be brought back to the machinist for repairs and imperfections.

The first commercial harvesters were produced by Ernst Blackwelder, a local machinist who became one of the project's later but crucial collaborators. By 1965, when the machines were mass-marketed, their imperfections had been recast as appealing challenges for prospective buyers. Advertisements featured growers like Al Fornaciari, of Roberts Union Island in the Delta, who had harvested an "amazing" 4,290 tons of tomatoes over 36 days without a single breakdown. It was Fornaciari's skills as a machinist (not as a farmer) that made the difference. Only with "preventative maintenance" could the machine stay in the field. In another ad, Steve Arnaudo looms large in front of his harvester, weeds held authoritatively in his hand, with the statement "weeds didn't stop my UC-Blackwelder" stamped over the scene in bold. In spite of following extension agents' recommendations for irrigation, row spacing, and heavy fertilizing for weed control, weeds controlled his field, threatening repeatedly to down the machine. Arnaudo's skill directing the harvester and navigating the weeds meant the difference between epic failure and his successful "four to five loads a day."[3]

The truth, really, was that no one knew how to grow for the machine or how to run it successfully through the fields once that crop was grown, universally ripe, and in need of immediate picking. At $50,000 to $200,000, each machine was an enormous investment, and risk, for the growers who bought it. To get their money back, growers had to expand their holdings. Many had to move to new fields where irrigation was more constant. All had to learn new pesticide practices and adjust to timetables in seed planting and harvesting so that as many fruits as possible could be picked in a single pass through a field. As one extension agent put it, in the early years of harvester experimenting, "we are all going to have to re-learn how to grow tomatoes." The "we" here was, not so subtly, the growers, in a trial by fire. By 1967 most farmers who were growing tomatoes in 1960 had been pushed out. Those few who succeeded commanded not only fleets of machines and acreage quadrupling their old holdings, but respect as leaders. Tomatoes had become a crucial industry for the state. For Ernst Blackwelder, the reason other farmers failed is because they just couldn't *get* the machine. If you could not "grow for the machine," he explained, you simply "fell by the wayside."[4]

At each phase of its development, the tomato-harvester project threatened to collapse and to take its human participants down with it unless they learned to think for the machine. In the end, a sufficient number of those humans did just that, thereby turning probable failures into success. They did this because the complexity of the task—the need to alter one's way of thinking entirely about machines,

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Grower Al Fornaciari of Roberts-Union Island area harvested 205 acres with his 1965 U.C.-Blackwelder Tomato Harvester, producing 4,290 tons of tomatoes in 36 days without a moment's mechanical breakdown while harvesting.

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Mr. Fornaciari's story of trouble-free operation wasn't the only one from a U.C.-Blackwelder owner—his just happened to be one of the best. From every tomato district in California, reports of amazing performance—of greater harvesting speed, of greater yields—poured into Blackwelder's Rio Vista headquarters.

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tomatoes, harvesting, and irrigation—demanded that they tie their *personal and professional* identities to the success of the harvester. Yes, the goal was to make money, keep the tomato crop in California, and address what many believed was a permanent labor deficit because of the end of the Bracero Program. But on the way to those practical goals, farmers, seed specialists, machinists, engineers, plant hunters, and extension agents also enhanced their opinion of themselves as innovators, risk takers, and leaders in California agriculture. This, as much as the industrial tomato, was what was made in the fields.

And maybe this is at least part of what we see when we're hailed from the road. Watching the tomato harvester at work, marveling at the synchronicity of metal and fruit, and puzzling over how such a thing can be even possible, we become simply the latest in a long line of believers thinking ourselves into this machine. **B**

Notes

* A fuller version of this piece is forthcoming in *Food, Culture, and Society*, volume 16.3.

1 Interview with Ray Bainer, A.I. Dickman, *The Oral History Accounts of the Development of the Mechanization of the Processing Tomato Harvester and of the Breeding of the Machine-Compatible Tomato*, Oral History Office, Shields Library, The University of California 1978, 29. See also 38.

2 Interview with Charles Rick, Dickman, 27.

3 For advertisements see *The California Tomato Grower* (March 1966; November 1966)

4 Interview with Ernst Blackwelder, Dickman, 67.