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Balancing Sustainability and Scale in California Agriculture

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How will we feed an ever-increasing number of people on a planet with finite resources?

Conventional agricultural practices, which include the use of herbicides, pesticides, antibiotics, and synthetic fertilizers, effectively remove many of the natural ecological limits on crop growth. This in turn leads to lower economic risk for farmers, higher yields, and cheaper prices. This tension, between agricultural yields and cost on one hand and the long-term sustainability of agricultural systems in an ecological sense on the other, is at the heart of many of the big sustainability questions we face today. As America's largest agricultural producer and exporter, California has been a global leader over the past 50 years in developing methods to make large-scale organic agriculture feasible and profitable.

Think about the last time you were in Rainbow Grocery, Whole Foods, Sprouts, or the organic section of some other supermarket. If you were to ask people shopping there why they choose to buy organic, many would respond with some variation of "because it's healthier for me and my family." Few, if any, would mention soil health.

I suppose that good things done for the wrong reasons are still good things.

Put simply, scientific evidence suggests that the health benefits of organic agriculture are far greater for the soil the crops are grown in than they are for the humans who eat those crops. Farmers know this. The problem is that doing the 'right things' for the soil—using natural sources of fertilizer and methods of pest control, letting fields lay fallow, mixing and/or rotating crops—can be a riskier strategy in the short term, leading to lower yields and higher prices. And that is not necessarily a good thing for affordable and equitable access to healthy food.

Every summer I teach an undergraduate core class called 'California Ecology.' In the third week of the class, students learn about ecosystem ecology (how flows of energy and matter structure biotic and abiotic systems) through the lens of California agriculture. During this module, we take two trips, each geared at exposing students to different aspects of agriculture in California. One is to Swanton Berry Farm, just north of Santa Cruz near Davenport, CA, and the other to the Russell Ranch Sustainable Agriculture Facility near UC Davis. These two sites (as well as Star Route Farms, the oldest continuously certified organic grower in California, which the University of San Francisco recently acquired) are examples of how determined innovation over decades can lead to organic agriculture being effective at a commercial scale.

Swanton Berry Farm was the first certified organic strawberry farm in the state of California (a state that produces more than 80% of US strawberries), and was instrumental in developing many of the methods that make it possible to commercially grow strawberries, a notoriously finicky crop, without toxic fungicides. Despite this history, it is still a relatively small farm. Russell Ranch, on the other hand, is located in the heart of big agriculture in the Central Valley. It is home to the Century Experiment, a 100-year-long scientific experiment spread out over nearly 100 acres, which seeks to understand the long-term effects of different farming practices (both conventional, organic, and mixed) on the long-term health of the soil and on crop yields.

It is not as simple as “organic is always better.” If all agriculture globally were to switch to the use of organic farming practices, it would increase costs to consumers and limit access to fresh fruits and vegetables for many. Doing the right thing for the soil and for environmental sustainability in the long run may cause real negative consequences for people in the present. The solution will be developing policies and market structures that incentivize us to wean ourselves off of the most ecologically problematic parts of conventional agriculture, such as the highly toxic pesticides and the irreversible depletion of mineral fertilizer reserves, and to develop new ways to

creatively use the ecological checks and balances that already exist in nature to feed ourselves over the long term instead of just maximizing short-term profit.

California has been and will continue to be, by necessity, at the forefront of figuring out how to innovate at the limits of sustainable agriculture. In this way, it is a model for understanding how to meet the needs of today without having to mortgage the needs of tomorrow in order to do so. As the population of the state, country, and planet continues to increase, we will have no choice but to develop ways to balance our need to feed ourselves, our children, and our grandchildren with the need to sustain the fragile ecological systems that make our planet a habitable one.

Naupaka Zimmerman is an Assistant Professor in the Biology Department at USF. As a microbial ecologist, his research interests focus on the interaction between plants and the beneficial microorganisms (bacteria and fungi) that associate with them. He is also interested in ways of building more quantitative and computational skills into undergraduate and graduate STEM curricula.