

Organic Agriculture in California

Why Organic?



the ecosystem: crop rotation, minimum tillage, and symbiotic associations aim to increase stability in soil systems. The soil becomes capable of retaining more nutrients and minerals, which makes up for not using fast-acting synthetic fertilizers*. Since the soil is not directly exposed to harmful chemicals, its biodiversity and overall health is increased naturally. Organic fertilizers such as compost and manure aid in strengthening soil while reducing groundwater pollution*. These practices can reduce the contribution agriculture has to global warming. Organic practices increase carbon retention and soil return, which decreases the agro-related greenhouse effect. Natural resource degradation is reduced, and wildlife and ecology is encouraged in the surrounding land in organic systems.

*Data courtesy of OSA.com

Here's the problem: less than 50% of seeds on organic farms come from organic origins in today's market. Even fewer are bred with organic methods in mind. Because of a lack of organic seed, farmers have turned to breeding for organic systems themselves. Since organic farms do not use synthetic pesticides or fertilizers, they rely much more on the genetics of each seed to help defend their crops against pests and diseases. Organic excels in environmental sustainability*, being much more friendly for the planet. Participatory organic breeding programs reduce corporate control, placing power back into the hands of the farmers sowing the lands. When farmers themselves are the ones directly interacting with the projects, they have a greater sense of importance in the outcomes of each trial. Organic farming is a cycle: the soil's organic composition can only remain intact with consistent organic farming methods*. The "proactive" method of organic farming seeks to tackle potential problems before they occur in

Organic Seed Alliance

- 501(c)3 nonprofit seed institution
- Addressing seed consolidation through regional collaborative networks of seed sharing
- Established a program to encourage future seed abundance by focusing on research, education, and advocacy

Research

- Regional breeding projects select for seeds with desired traits
- Release new varieties for trial at regional farms



- New innovative seed systems hope to foster greater output
- Systems are decentralized collabs between farmers, breeders, consumers, and businesses

Education

- OSA provides an extensive database of seed growing publications
- A quarterly news letter and frequent events connects farmers to the latest info
- Internships and Organic Seed Growers Conference target younger generations to encourage future organic practice



Advocacy



- OSA engages in seed policy through coalition work to fight privatization and consolidation
- The State of Organic Seed Project advocates for organics by monitoring the state of organic projects in the US
- This provides a roadmap for market improvement

The California Crops



- **Region:** many cultivars, vary in preference: coastal foothills, high/low deserts, inland valleys
- **Farms:** College of the Redwoods, UC Davis, Cal Poly Pomona
- **Qualities:** The Tomato Organic Management and Improvement Project goal: with help from the SCOPE project, improve foliar pathogen resistance, which causes early or late blight that looks like spotting on the leaves, while selecting for high quality color and flavor

Tomato



Wheat

- **Region:** Imperial County, San Joaquin Valley, Yolo County, southern valley
- **Farms:** UC Davis, Wild Rose Farm
- **Qualities:** OSA and SCOPE's collaborative variety trials hope to put out new cultivars with improved yield, weed competitiveness, lodging and disease resistance, quality flavor. Additional project to decrease nitrogen and water use in wheat production



- **Region:** 4 main: southern desert valley, south coast, Central Valley, central coast
- **Farms:** College of the Redwoods, Clover Creek Farm
- **Qualities:** Northern Organic Vegetable Improvement Collaborative hopes to release varieties with higher resistance to fungal contamination from cold and damp soils, along with strong husk protection, early vigor, disease resistance, creamy flavor

Corn



Pepper

- **Region:** across California: Central Valley, southern coastal- prefer mild nights, limited sun
- **Farms:** UC Davis
- **Qualities:** OSA partners with the SCOPE project, which is working to create a bell pepper with increased sunscald tolerance and a larger internal cavity for pepper poppers



- **Region:** across California: Sacramento, northern San Joaquin Valley-prefer sun, drained soil
- **Farms:** UC Davis
- **Qualities:** OSA collaborates with the SCOPE project, selecting for seed color and pattern, higher yield, resistance to common bean mosaic virus, preferred early season growth rate

Common Bean



Lima Bean

- **Region:** Sacramento Valley, central coast- not reliable in consistently hot/dry temperatures
- **Farms:** UC Davis
- **Qualities:** Also through the SCOPE project, lima beans are being selected for size and bush type, with emphasis on Lygus resistance, a bug that can cause up to 70% yield loss when no pesticides are used. Having a resistant line would also mean fewer pesticides used in conventional lima production



- **Region:** small California market-thrives in Northern California, coast and temperate valleys
- **Farms:** Wild Rose Farm
- **Qualities:** OSA collaborates with Blake Richard to develop new varieties of quinoa that are cultivated via dryland farming, or farming without using irrigation. Quinoa is being selected for disease resistance, size, and yield

Quinoa

California Organic Breeding Projects

1

College of the Redwoods, Eureka

Manager: Franz Rulofson

Crops: sweet corn, tomatoes

- 36 acre, student run sustainable farm in Shively with produce grown primarily for farmer's markets and sold to students at discounted rates (Farm Share Program)
- Over 50 varieties of organic sweet corn tested with OSA for resistance to cold, disease, and superior flavor
- Emphasis on sustainable agriculture as the future: The 3 E's-Environment, Economics, & Social Equity

2

Wild Rose Farm, Blue Lake

Owner: Blake Richard

Crops: hay, vegetable seed, wheats, chards, quinoa

- Dryland farming: non-irrigated crop cultivation, optimal in locations with wet/ cold winters, hot/dry summers
- Richards specializes in dryland techniques, recently partnering with OSA to test 300 lines of quinoa for greater yield, disease resistance, and larger size
- Wild Rose sells produce below market price and provides jobs to many locals

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Luna Farm, Redcrest

Owner: Amy Diekmeyer

Crops: cabbage, turnips, kale, cauliflower

- Offer a Community Supported Agriculture program, connecting locals to the farm with a fresh produce subscription and access to the farm and its producers
- Prioritize the community overall, selling their produce at local farmer's markets
- Partner with OSA to create variety trials of tomatoes, searching for market quality and disease resistance.

4

Clover Creek Farm, Upper Lake

Owner: Annelle Durham, Thurston Williams

Crops: grains, beans, grapes, sweet corn

- Focus on biodiversity and crop rotation for sustainable fertility, incorporating fungi and bacteria species into soil through cover crops, cultivating weeds with crops
- Variety trials on sweet corn with OSA to improve resistance to disease, cold, and taste
- Committed to production for local consumption in the North-Coast bio region only



5

UC Davis, Davis

Director: Charlie Brummer

Crops: wheat, tomatoes, peppers, Limas, Common beans

- USDA funded Student Collaborative Plant Breeding Education Project aims to intertwine learning with doing, as students work on the student farm to manage a plant breeding program and release market cultivars
- Goal is to produce varieties adapted to organic growing systems, as well as educate the next generation of organic farming innovators

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Coast Range Seed, Petaluma

Owner: Eric George

Crops: swiss chard, mustard, kale, squash

- Open Sourced Seed Initiative pledged varieties of produce: decentralizes plant breeding and seed production, increasing quantity of seed receivers
- Emphasis on increasing nutritional value in produce through soil fertility and minerality, with a goal of producing seeds for the community, along with for local farms to use and eliminate some corporate control

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Coke Farm, San Juan Bautista

Owner: Dale Coke

Crops: beets, chard, kale, celery

- What began as an organic strawberry farm in 1981 has developed into a company organizing local coastal farms, aiding growing plans and shipping their produce
- Their cooling and shipping facility allows local organic produce to be shared nationally and internationally
- Market of over 60 farmers increases variety of available produce and creates a local market for organics

8

Cal Poly, Pomona

Owner: Dave Mattias

Crops: green beans, tomatoes

- 9.5 acres on Sprada Farm became certified organic in 2019, where Huntley College of Agriculture provides classes in sustainability, crop rotation, and biodiversity
- Students participate in the USDA-funded Healthy Soils Demonstration Project to improve soil nutrition through composting
- Work with OSA, select tomato breeds for hybridization

Disease and the Solution

Plants and their pests

Crop failure due to disease and pests is a point of emphasis in organics, and a breeding program with successful resistance could be monumental. Take lima beans as an example: the tarnished plant bug, or Lygus, ravages up to 70% of total yield. According to the USDA, this pest feeds on flowers and meristematic plant tissue in not only limas, but in hundreds of agriculturally important plants. Research of Lygus attraction to certain species assumes a certain compound release entices the bug. In tomato breeding, a central goal is to target *cladosporium fulvum*, an ascomycete fungi that causes leaf molding. According to NCBI, some controls, such as temperature adjustment and proper sanitation in the greenhouse are applicable, but not preventative in the long run. Lines of fungal-resistant cultivars are known, which means incorporating these with higher quality cultivars could lead to market success. Sweet corn also faces fungal contamination from *Ustilago maydis*, which grows on all corn species. Since the fungus thrives in the cold, damp soil, breeders select for varieties with early vigor and greater cold tolerance. According to a Virginia Tech publication, known partially resistant hybrid species could lead to a resistant line. In the common bean, plants containing the I-gene are resistant to the common bean mosaic virus. This success has begun to spread through the market, with future plans of eradicating the non I-gene lines altogether.

The importance of breeding for genetic strength, as opposed to relying on chemicals, comes down to the long term successes of each option. When opting for seed resistance, the capacity for the pest to overcome this resistance, as opposed to adapting to a pesticide, is a lot less likely.



Lygus bug |
photo courtesy
of ucanr.edu

Putting the
power of
seeds into
the hands
of the
growers

Tomato blight |
photo courtesy of
ipm.uconn.edu



Seed Summit 2018 in Petaluma, CA

To seed summit--and beyond

Californians have assessed the problem, and they are here to solve it! The Seed Summit is an annual collection of farmers, researchers, professionals and advocates from throughout California who reflect on productivity, seed quality, and soil health and nutrition. Because of the small (but ever growing) quantity of organic farms and especially experienced organic growers in each region, this amalgamation offers valuable knowledge that would be difficult to obtain without this organized gathering.

The main goals of the summit are to expand organic agriculture in California, and the individuals involved hope to do so through their plan of "outreach, education, infrastructure, and networking". Many involved are in the Organic Seed Alliance. Their efforts, in alignment with goals for research, education, and advocacy, includes an Organic Seed Growers Directory to foster a community of seed sharing within the local market. Participants share their own findings, field techniques, and beliefs in quality and customer satisfaction to further enhance farm to farm relation and market standards. The last seed summit occurred in Petaluma, with over 37 participants looking to change the face of agricultural infrastructure in their state and, eventually, throughout the country.