

# Organic Strawberry Fields Forever Final Report: Evaluation of Organic Strawberry Transplants for Organic Strawberry Production (2018-2019)



A Joint Proposal Submitted by: Organic Advocacy and Farm Fuel

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**Organic Advocacy**



## 1. Project Summary

Conventional strawberry nurseries have fumigated nursery soils for decades with methyl bromide, chloropicrin, Telone and other highly toxic, synthetic chemicals. These nurseries have served as the sole source of transplants for both conventional *and* organic strawberry farmers. While many organic growers have expressed dissatisfaction with having to use conventional transplants, they have no choice because organic transplants have not been commercially available. The “commercial availability clause” contained in the USDA’s National Organic Program (NOP) regulations indefinitely allows organic farmers to legally grow their fruit from conventionally propagated transplants without delineating a timeframe for phasing-out their use. As such, there has been little push from market forces to make organic strawberry transplants available to farmers who grow public varieties. Research and investments are needed to address these limitations in the organic strawberry industry and to secure a stable, commercial supply of field-tested, public varieties of organic transplants.

In 2015, the *Organic Strawberry Fields Forever* (OSFF) project in conjunction with Farm Fuel Inc. (FFI) conducted a study to determine whether organic propagation systems can provide organic growers with high quality transplants comparable to their conventional counterparts. Greenheart Nursery in Arroyo Grande agreed to produce 7,000 organic plug plants for the field trial, which was conducted on six organic farms in Santa Cruz and Monterey Counties. While the organic plugs performed equally as well as the bareroot conventional plants in this initial trial, the plug plant propagation method proved to be far too costly and the nursery ceased that aspect of its production.

Building on the experience of our previous research, the goal of this field study is to compare organic bareroot transplants with conventionally managed transplants in organic strawberry fields. Bareroot transplants are the ones most commonly used in strawberry production. In collaboration with five OSFF organic growers, we conducted a comparative study at five sites in Santa Cruz, San Mateo and Monterey Counties during the 2018/2019 growing season — November through September. Each site was designed as a replicated randomized complete block trial that examined plant growth, disease occurrence, and harvestable and non-harvestable yields. Both types of transplants had roughly the same dig date, chill hours and organic production protocols. A group of 20 plants at the center of each plot was marked off with colored coded tape to serve as the data collection “window” for diameter, disease and yield measurements. Field data conclusively demonstrated that organic transplants performed equally if not better than conventional transplants at each field site. We found no significant disease occurrence at any field site for either the organic or conventional transplants.

It is our hope that the data compiled from this field trial will afford organic strawberry growers with the reassurances they need to begin transitioning their farms away from conventional transplants. With this latest data now publicly available, we anticipate greater interest from strawberry nurseries in California to produce organic strawberry transplants. Additionally, with the backing of California Certified Organic Farmers (CCOF), organic strawberry farmers will be legally required to grow organic transplants and fully transition to organic as the supply grows to meet the demand.<sup>1</sup> Once organic transplants become the industry standard for organic strawberry growers across the state, approximately 1.3 million pounds annually of the most hazardous pesticides will no longer be released into the environment.<sup>2</sup>

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<sup>1</sup> <https://www.ccof.org/commercial-availability-organic-strawberry-starts>

<sup>2</sup> Bolda, M. UC Cooperative Extension, Strawberry and Caneberry Farm Advisor. Personal Communication. Nov. 29, 2016.

## 2. Introduction to Topic

All organic and conventional strawberry farmers grow their fruit from transplants. But, until the launch of the OSFF project, organic farmers planted only conventional transplants because no organic transplants were commercially available. While their farms and farming methods were organic, organic strawberry farmers used conventional transplants grown in soils fumigated with synthetic, highly toxic and ozone-depleting chemicals. They had no other option. This practice has continued for decades because the Organic Foods Production Act of 1990 (OFPA) permits the use of conventional transplants until an organic supply is available. Recognizing that the absence of a reliable source of field-tested, public varieties of organic transplants was blocking organic farmers from relinquishing their use of conventional transplants, Dr. Lisa J. Bunin, Policy Director at Center for Food Safety, created OSFF to jump-start the organic supply and demand.

Beginning with a day-long *Organic Strawberry Summit* held in 2013, Bunin organized a series of stakeholder meetings over six years which explored what it would take to transition the organic strawberry industry. A significant outgrowth of those meetings was the formation of a new organic strawberry nursery, Innovative Organic Nursery (ION). Three years into the project, the company formed to produce organic transplants and capitalize on the untapped market. Yet even in light of this emergent supply, growers still wanted assurances that organic transplants would perform comparable to conventional before making the switch. To address this need, Bunin, now Director of Organic Advocacy (OA), teamed up with Stefanie Bourcier, CEO of Farm Fuel Inc. (FFI), and together they received a grant from the Organic Farming Research Foundation (OFRF) to test the field success of public varieties of organic transplants versus conventional transplants.

In California alone, approximately 80 million<sup>3</sup> organic transplants are needed to supply all organic strawberry farmers. Public varieties, the subject of this field research, comprise an estimated 36 million<sup>4</sup> of the total organic transplant market in the state. OSFF emerged to help facilitate the move towards using organic transplants which had been hindered in large part by one important, unresolved field research question: do organic transplants perform comparably to their tried and true, conventional counterparts on the same farm field? With an OFRF grant, OSFF undertook to answer this critical question by conducting field trials.

## 3. Objectives Statement

The objective of the OSFF field trial was to address organic strawberry farmer concerns about the viability, disease occurrence and yields of organic transplants when compared with conventionally grown transplants in farm fields. To that end, we collected and analyzed field data from organic bareroot transplants and compared them with conventional bare root transplants at five field sites. In addition to two farms in Santa Cruz County, we added farms from the neighboring counties of San Mateo and Monterey Counties, which were not included in our original research proposal. The decision to add sites in other counties was based on farmer interest in joining the field trial.

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<sup>3</sup> Based on California Strawberry Commission data: California Strawberry Commission. (2019) "California Strawberry 2019 Acreage Survey."

<sup>4</sup> *Ibid*

**Table 1. Farm, variety, location, planting date and number of plants per treatment.**

Farm	Variety	County	Planting Date	No. of Plants per Treatment
Farm 1	Chandler	San Mateo	10/31/18	2000
Farm 2	Albion	Santa Cruz	11/15/18	1600
Farm 3	Albion	San Mateo	11/8/18	1650
Farm 4	Albion	Santa Cruz	11/8/18	2000
Farm 5	Chandler	Monterey	12/1/18	1500

### *Field Data Collection*

Starting in January 2019, plant diameter of 20 plants within each test plot was measured in centimeters over the widest portion of each plant (Objective 1). Diameter measurements were taken once a month through the end of September. Disease assessment was performed by conducting a wilt score analysis on 20 plants in each test plot (Objective 2). Each plant was visually observed for wilt and then assigned a score between 0 - 4.<sup>5</sup> Scores quantified the prevalence of wilt in each plant, with a 0-score indicating there was no wilt and a 4-score indicating the most severe level of wilt. Wilt scores were taken once a month, beginning in January and concluding at the end of September. Once fruit began to appear in late March to early April, data on yields was collected once a week (twice a week as needed) until the end of harvest season in September (Objective 3). Total plot yield (grams) and individual fruit weight (grams) were measured. The quality of harvested fruit was split into marketable and unmarketable categories based on the individual grower's preexisting fruit quality standards.

Yield and fruit weight data were divided into two sections; "early yield" and "late yield." Early yield comprised data collected in early March to May, and late yield comprised data collected from June to the end of harvest season. Regression analysis was conducted using StataIC 16 software.

It is worth noting that this field trial design was modeled after our previous field trial, which we developed in consultation with UC Cooperative Extension (UCCE), using widely accepted field trial protocols. These methods were then adapted to each field site location with the feedback of individual growers. This design and process further optimized the value of the trial by replicating the real growing and planting conditions of each farmer.

### *Objectives/ Measurable Outcomes*

Our field results addressed the following objectives and matched them with the following measurable outcomes:

**A** - Are organic strawberry bare root transplants as viable in the field as conventional strawberry transplants? To determine this, plant diameter measurements were taken once a month from both organic and conventional plants and recorded and compared from time of establishment in January

<sup>5</sup> Wilhelm, S., J.E. Sagen, and H. Tietz. 1974. Resistance to Verticillium Wilt in Cotton: Sources, Techniques of Identification, Inheritance Trends, and the Resistance Potential of Multiline Cultivars. *Phytopathology*, 64: (924-931).

2019 through the entire harvest season ending in September 2019. Outcome: Organic strawberry bare root transplants, with regard to plant diameter, are as viable as conventional strawberry transplants.

**B** - Do organic strawberry bare root transplants have a different incidence of disease when compared to conventional strawberry transplants? Disease scoring was conducted at each site once a month, comparing organic and conventional plants at the first signs of disease occurrence through harvest.

Outcome: Organic strawberry bare root transplants are not more susceptible to disease, with regard to leaf wilting, as conventional strawberry transplants.

**C** - Do organic strawberry bare root transplants have the same yields as conventional strawberry transplants? Weekly yields (biweekly as needed) were collected from both the organic and conventional plants and compared through an entire harvest season.

Outcome: Across all farms together, organic strawberry bare root transplants have statistically comparable yields to conventional strawberry transplants. Only one farm had early season marketable yields that were higher for conventional transplants. Similarly, one farm had early season unmarketable yields that were higher for conventional transplants compared to organic transplants.

**D** - What is the adoption rate of organic transplants for the future? OSFF participant farmers were asked to reflect on their experience growing organic transplants in our final meeting and asked whether they will continue doing to grow organic transplants in the future. We also asked representatives from ION how well their transplants were received by the farmers who grew them and to estimate their upcoming year's sales projections.

Outcome: All OSFF farmers expressed complete satisfaction with organic transplant quality, yield and lack of disease. They also all agreed that they would grow organic transplants again. ION received overwhelmingly positive feedback from the organic farmers who grew their transplants, in addition to OSFF farmers. Subsequently, ION increased its production from 750,000 to over one million transplants for the 2019/2020 growing season.

#### **4. Educational Approach**

Two farmers who participated in our previous field trial joined this one. They are well-known and respected leaders and innovators in the organic farming community. We also reached out to farmers who had attended OSFF meetings and expressed an interest in becoming more involved in the project. OSFF farmers were involved in the design of the field site, they chose the location on their farm, and regularly met with those collecting the field data to discuss how the research was progressing. In addition, we held check-in meetings by phone for OSFF farmers to share their experiences, ask questions, and ascertain if there were any difficulties that needed addressing.

Organic strawberry farmers repeatedly stated at OSFF meetings that they would like proof that organic transplants can perform as well as conventional before they were willing to take the risk of planting them. In the view of many, conventional transplants work just fine and they do not want to take a chance in having an economic mishap. At that same time, farmers understand that relinquishing conventional transplants use on their organic farm is inevitable.

Field trials conducted by neighbor farmers have been shown to be a good tool for demonstrating the viability of a given crop, method or input and for inspiring farmer adoption. That is why we chose to organize an organic strawberry industry meeting to disseminate our field trial results. Like meetings in the past, we held our meeting at UC Cooperative Extension in Watsonville because farmers are familiar

with that location and it is easily accessible. The material presented provided concrete evidence to help growers and others in making decisions regarding their future production and use of organic transplants.

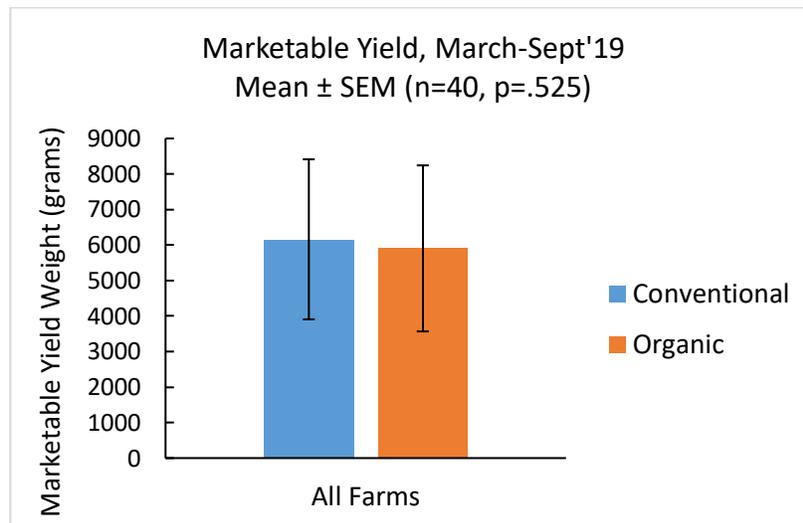
## 5. Project Results

### *Field Data, Statistical analysis:*

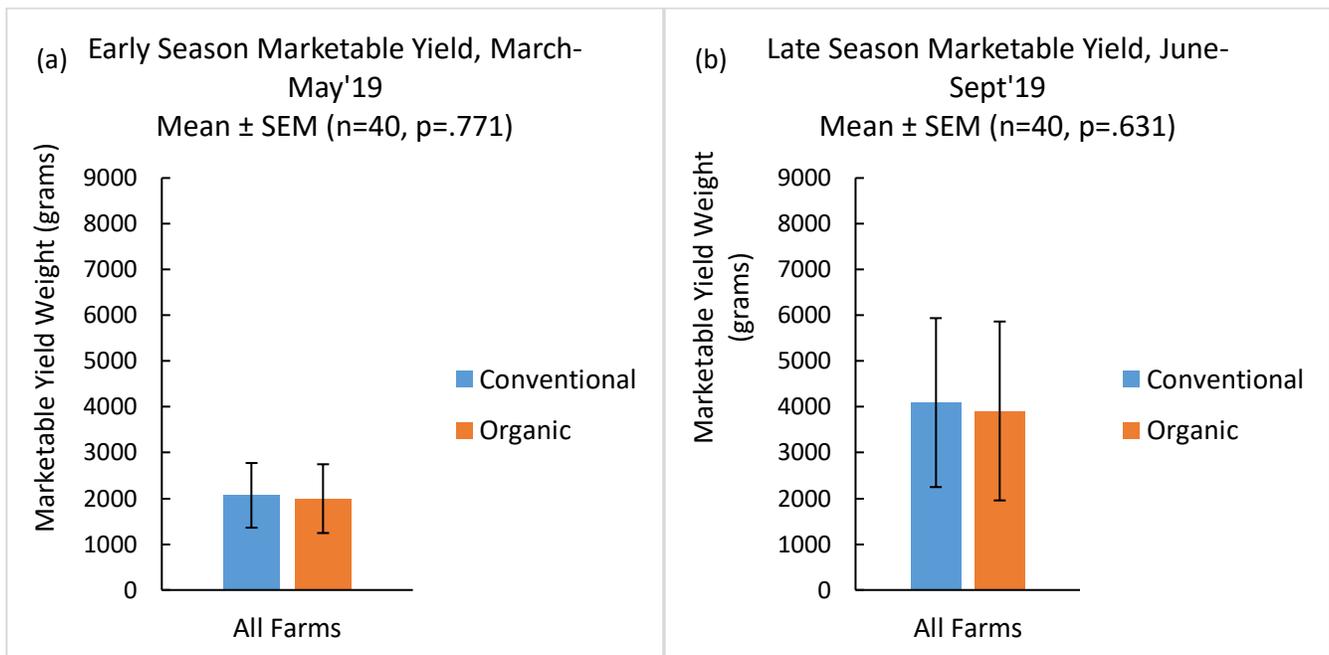
Statistical analysis was conducted using a regression analysis to regress total marketable and unmarketable yield, average marketable fruit weight, plant canopy diameter, and wilt scores. This was done for both treatments (organic and conventional), and both varieties (Chandler and Albion), and on each farm site. Categorical variables were appropriately coded for and standard errors were clustered at the block level.

Looking at the average marketable yields for the whole season across all farms, there was not a statistically significant difference between organic transplants compared to conventional transplants, with a p-value of .525 (Figure 1). Similarly, when marketable yields were divided into early yield and late yield, there were still no statistically significant differences between organic and conventional transplants, with a p-value of .771 and .631 respectively (Figure 2). One thing to note is that when looking at the individual farm data, there were statistically significant higher early season marketable yields for the conventional transplants as compared to organic at Farm 2, with a p-value of .073 (Figure 3).

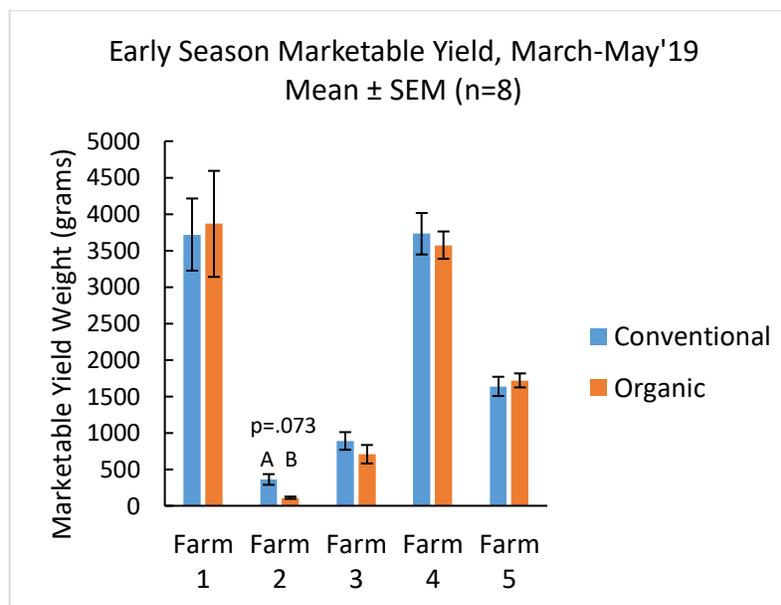
**Figure 1. Marketable strawberry yield (grams) for all farms between March and September 2019.**



**Figure 2. Early season (a) and late season (b) marketable strawberry yield (grams) for all farms.**



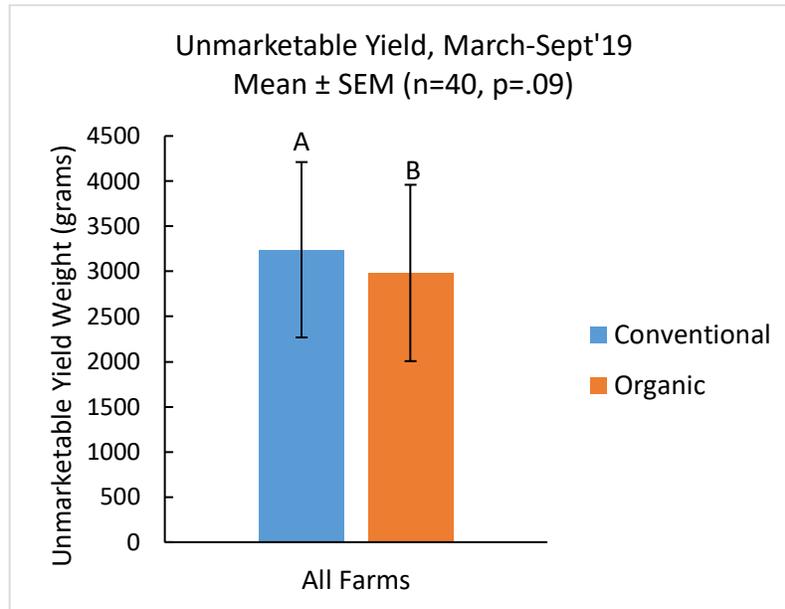
**Figure 3. Early season marketable strawberry yields (grams) for each individual farm.**



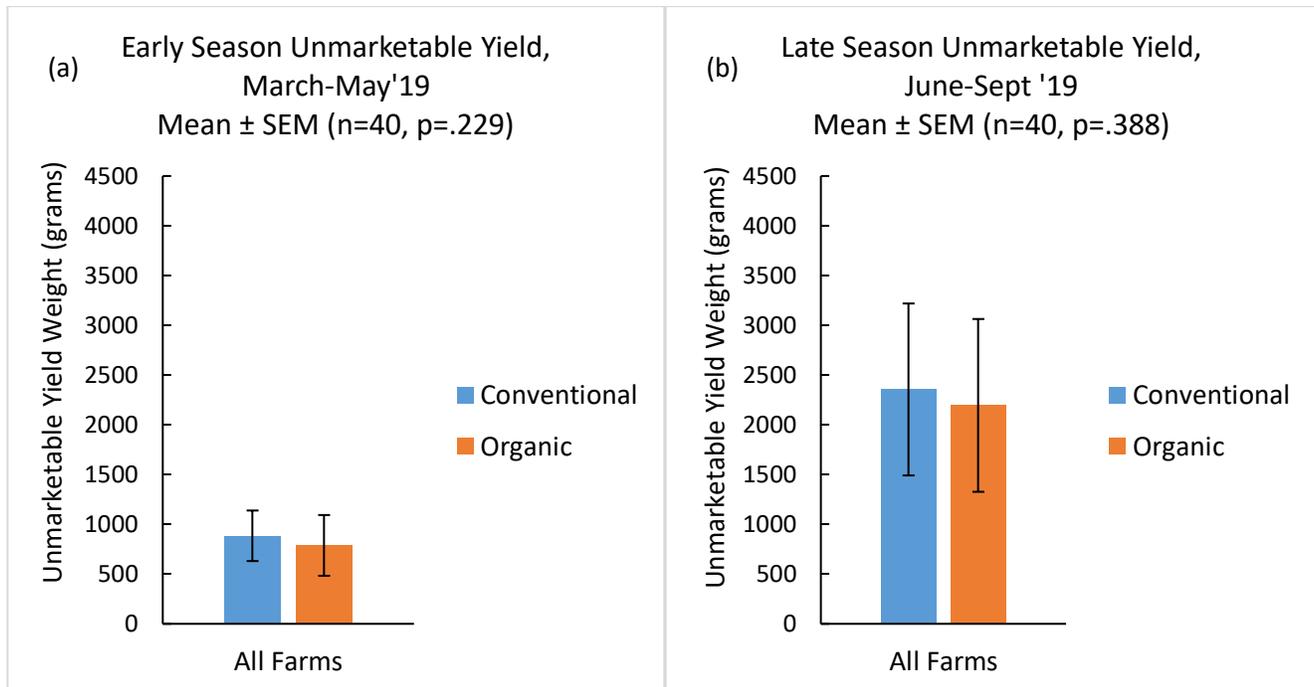
With regard to average unmarketable yields across all farms for the whole season, conventional transplants had statistically significant more unmarketable yields than organic transplants, with a p-value of .09 (Figure 4). However, when unmarketable yield data were split into early and late season yields, this statistically significant difference disappeared, with a p-value of .229 and .388 respectively (Figure 5). Looking at the individual farms, however, Farm 3 had statistically significant higher early season unmarketable yields for the conventional transplants as compared to organic, with a p-value of

.011 (Figure 6).

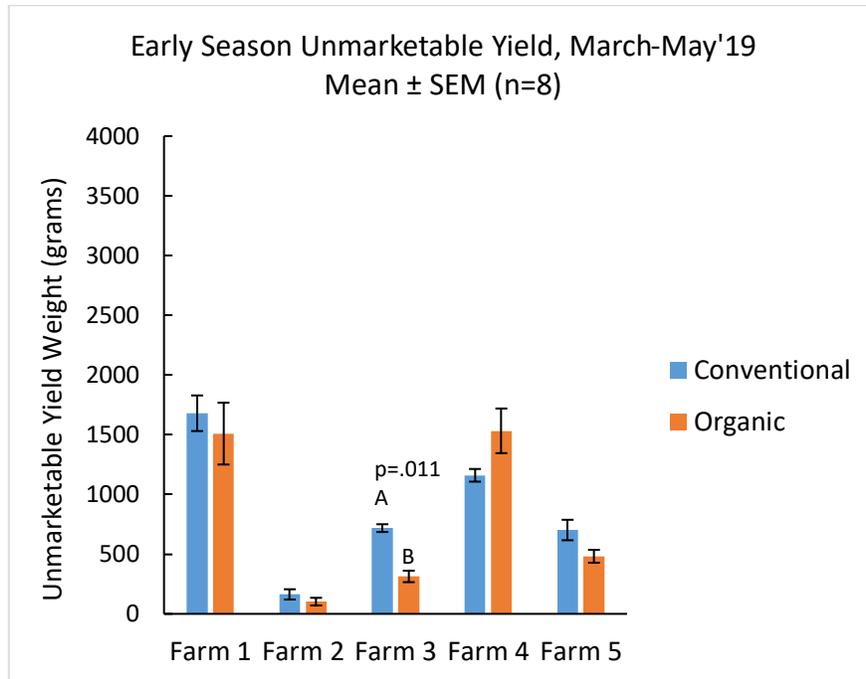
**Figure 4. Unmarketable strawberry yield (grams) for all farms between March and September 2019.**



**Figure 5. Early season (a) and late season (b) unmarketable strawberry yield (grams) for all farms.**

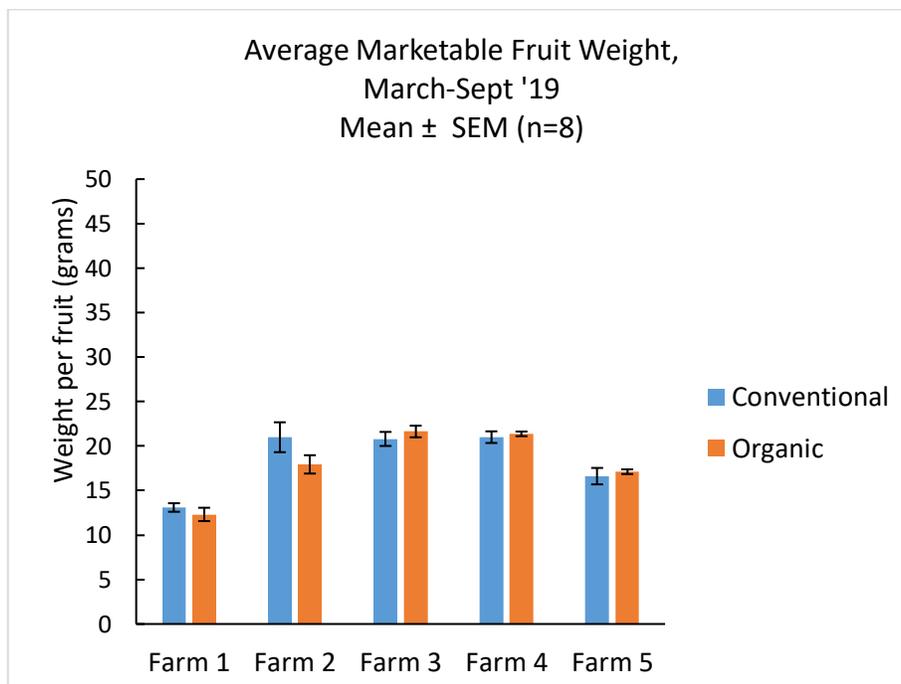


**Figure 6. Early season unmarketable strawberry yields (grams) for each individual farm.**

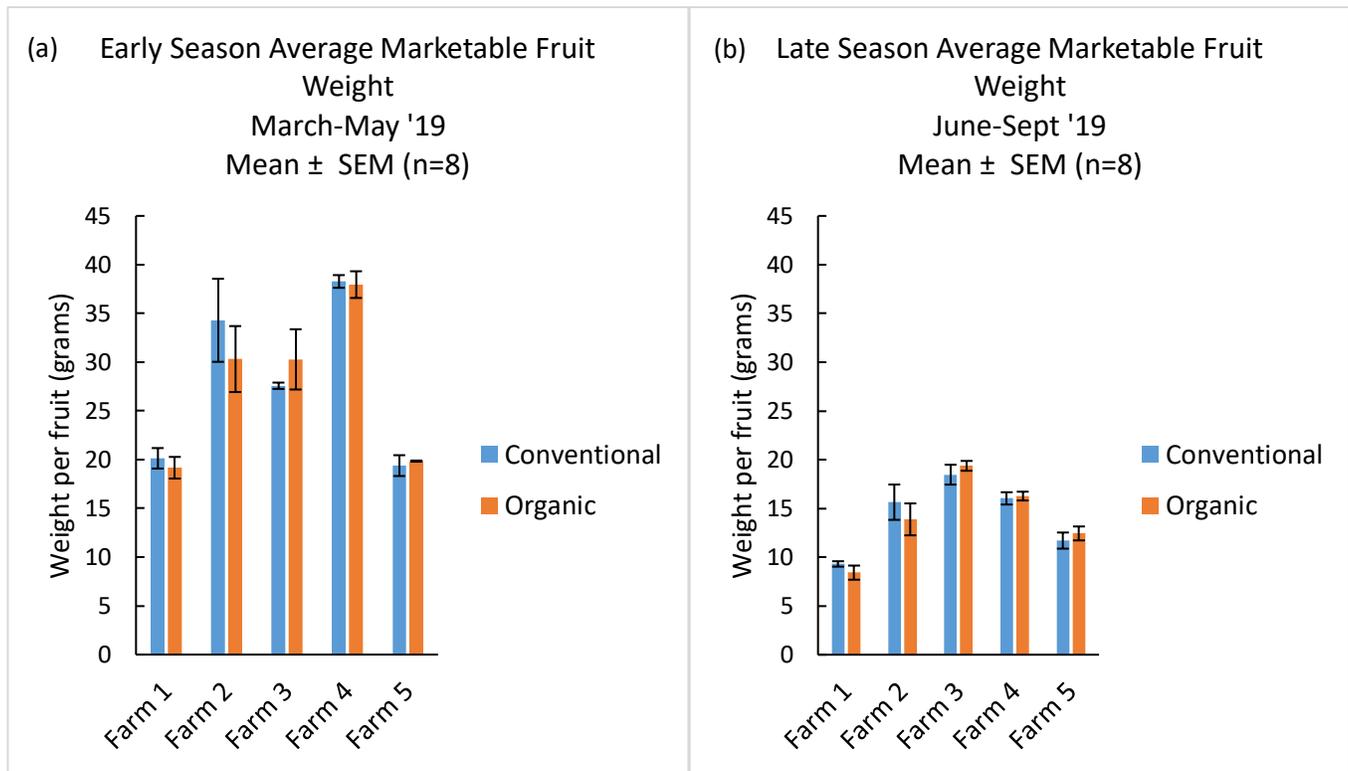


Average marketable fruit weight (grams/fruit) for conventional and organic transplants were not statistically significantly different from one another across all farms and all points in the harvest season (Figures 7 and 8). Similarly, for plant canopy diameter and disease wilt scores averaged across all farms, there were no statistically significant differences between organic and conventional transplants (Figure 9 and 10).

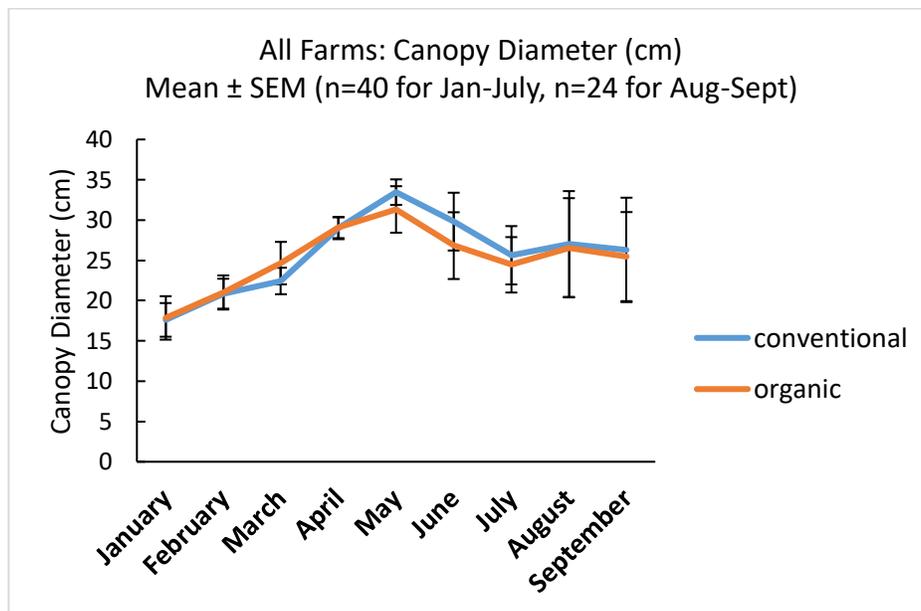
**Figure 7. Marketable fruit weight (grams) for each farm individually.**



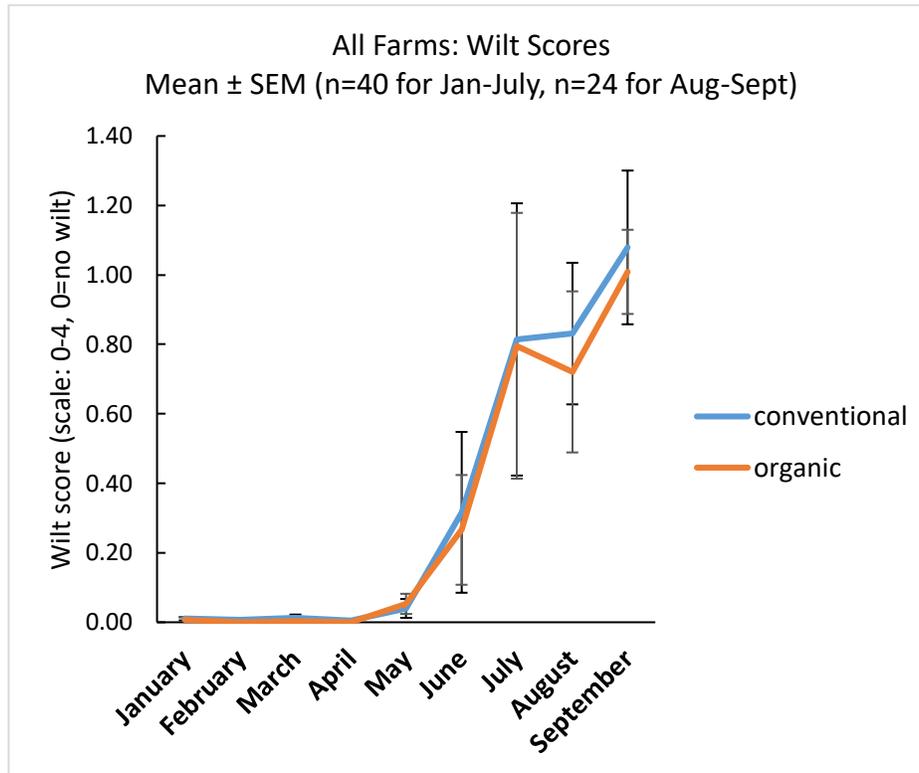
**Figure 8. Early season (a) and late season (b) marketable fruit weight (grams).**



**Figure 9. Average plant canopy diameter across all farms.**



**Figure 10. Average wilt score across all farms (0-score equals no wilt; 4-score equals 75%-100% of leaves wilted).**



### Grower and Nursery Feedback

We interviewed OSFF growers after the final harvest about the plant quality, yield, disease and overall production performance. This was done in a group setting and on an individual basis. We chose to use verbal, personal interviews as opposed to a handwritten questionnaire because our experience has shown that growers tend to be more responsive to verbal versus written communication. OSFF farmers unanimously and unreservedly agreed that they were satisfied with the performance of the organic transplants in comparison to the conventionally grown transplants. All field trial participants stated that they would use organic transplants again the following season, without reservation. The organic nursery participating in the trial, ION, reported in a follow-up interview that based upon market demand and the positive feedback received from this trial, the company will increase production for the 2019/2020 production year.

### 6. Conclusions and Discussion

OSFF's field trial research has conclusively demonstrated that organic transplants perform comparable to conventional transplants in farm fields on the Central Coast of California with respect to plant growth, disease occurrence, and harvestable and non-harvestable yields. The data and analysis presented in this report, and at our organic strawberry stakeholder meeting at UC Cooperative Extension in Watsonville, are intended to provide organic strawberry growers with the confidence they need to begin their transition to organic transplants. It is also expected that our field data results will pique the interest of strawberry nurseries to begin growing organic transplants to meet the anticipated increase in demand.

In terms of project hurdles, the primary one was the delay of our field trial for one year, due to the unavailability of organic strawberry starts from the nursery. For this reason, OFRF graciously allowed us to conduct our research during following year. This situation reflects the very real concern that the organic strawberry stock is limited by location and providers and that multiple organic strawberry nurseries are needed to supply farmers with a stable source of organic starts.

Once the project had begun, challenges faced in the field were not uncharacteristic of field trials in the central coast of California. Heavy rain and mud were consequences of a late spring rainy season, which made data collection challenging at times. Issues with communications between our field technicians and the growers' pick crew on site were not atypical. With field sites stretched over three counties, driving time and flexibility were sometimes an issue for field technicians, but they were overcome.

In terms of future research, a subsequent study of the same public varieties at the same farms would also be useful to corroborate our research results.

Since this study trialed only two public varieties of organic transplants, Albion and Chandler, organic strawberry growers would benefit from field tests of other public varieties. Trials are also needed in other regions where strawberries are grown and where different microclimates and growing conditions are present.

This type of project aimed at facilitating a major change within the organic strawberry industry would undoubtedly benefit from multiple years of research and funding. As such, an institutional home at a college or university is sorely needed where year-round resources and labor could be devoted to support the growth and development of organic strawberry transplant research and development.

Although our study tested organic transplants under organic growing conditions, the cultivars used have been propagated in and for conventional agricultural systems. In fact, most if not all of the university-based research on public varieties of strawberry cultivars in California is exclusively focused on the development of conventional cultivars. On occasion, these conventional cultivars are tested on organic farms, but they are still not bred for organic conditions. The organic strawberry industry would hugely benefit from university-bred, public cultivars of organic strawberry transplants specifically designed to grow in organic production systems.

## **7. Outreach**

The intent of our research was to conduct field research and present our results to the wider organic strawberry stakeholder community. On 25 November 2019, we held the latest in a series of two hour meetings organized over the past six years to discuss technical and regulatory impediments and opportunities for transitioning the organic strawberry industry to use organic transplants. We held our meeting at the UC Cooperative Extension office in Watsonville because it offers a central location and easy access for meeting participants. Announcements of the meeting were sent to OSFF's list of more than 100 stakeholders including farmers, nurseries, researchers, public interest organizations, organic input suppliers, and organic certifiers. They were also sent to the UC Cooperative Extension list and posted on CCOF's website.

Bunin, from Organic Advocacy and Fernando Garcia from Farm Fuel gave PowerPoint presentations about the evolution of OSFF, the findings of our field trials, how the data collected provided the

necessary information for the organic strawberry growers to feel confident about transitioning to organic strawberry transplants. The presentations also provided information useful to nurseries who may be considering producing organic transplants, given the impending increase in demand. Maria Barajas, from CCOF, discussed the certifier's expectations of organic growers now that organic transplants are available. James Rickert, from ION, discussed the past year's success and the nurseries plans for the future. Emily Musgrave, from Driscoll's, the worlds' largest organic strawberry producer, discussed the multiple technological and regulatory challenges they faced growing proprietary organic transplants and moving them across state lines.

OSFF has produced a 2 page summary of the project in Spanish and English and it is featured on Bunin's website: [www.organicadvocacy.org](http://www.organicadvocacy.org). We also created a poster board display, with photographs and a description of the OSFF field trial, which was exhibited at Farm Fuel's Sustainable Strawberry meeting. Bunin has been invited to write an article about our OSFF research for PCC Natural Markets' publication, *Sound Consumer*, for its summer edition. The natural food market has 13 stores in Washington and 70,000 members. *Edible Monterey* magazine is interviewing Bunin about the field trial for its summer issue.

Farmer participants in the OSFF field trial often host farm tours where they routinely discuss our organic strawberry transplant research. In January 2020, one of our OSFF farms, JSM Organics, was a stop on EcoFarm's annual farm tour where Javier Zamora explained his participation in our field trial and his satisfaction with growing strawberries from organic transplants. At the annual EcoFarm conference, Zamora also moderated a workshop in Spanish where he discussed his experience growing organic transplants, the success of the field trial, and encouraged others to trial organic transplants on their farms.

## **8. Financial accounting**

Budget expenditures are detailed in the attached document *OSFF Budget*. Table 2 below details the estimated versus actual costs of the trial. As expected, the primary cost of the project was labor hours, as moving between field sites in three counties, collecting data and data management were time consuming. Since this trial was delayed a year, beginning in 2019 instead of 2018 as originally proposed, the production and printing costs of the initial outreach materials provided to the community were absorbed by Organic Advocacy. The project budget was over by \$97.53, this cost of which was absorbed by Farm Fuel Inc.

**Table 2. Estimated versus actual budget for OSFF project.**

Total Budget				
Item	Details	Estimated Total	Actual	Notes
Strawberry transplants	conventional strawberry transplants (unit=1000transplants)	\$1,420.00	\$1,264.00	
Mileage to sites	mileage to five sites - once a month in January and February, then four times a month from March through September	\$2,160.00	\$1,815.00	Mileage rate changed to \$0.58/mile
Labor - data collection	# of hours spent collecting data	\$8,380.00	\$9,394.32	
Outreach	printing costs	\$200.00		Outreach materials were purchased by Organic Advocacy before the start date of the grant and will not be included here
	website updates	\$150.00		
Field supplies	marking tape, flags, etc.	\$150.00	\$84.22	
Organic Advocacy administrative/outreach coordination	maintain communication with all project stakeholders throughout the entirety of the project, coordinate outreach and reporting	\$2,500.00	\$2,500.00	
Total		\$14,960.00	\$15,057.53	Overbudget expenses were covered by FFI

## 10. References

Bolda M, Klonsky, K., Tourte, R.L., De Moura, L. & K.P. Tumbler. (2014) Sample Costs to Produce Organic Strawberries, Central Coast, Santa Cruz, Monterey and San Benito Counties, UC Cooperative Extension. [https://coststudyfiles.ucdavis.edu/uploads/cs\\_public/94/4b/944b5aad-6660-4dcd-a449-d26361afcae2/strawberry-cc-organic-2014.pdf](https://coststudyfiles.ucdavis.edu/uploads/cs_public/94/4b/944b5aad-6660-4dcd-a449-d26361afcae2/strawberry-cc-organic-2014.pdf)

California Strawberry Commission. (2019) "California Strawberry 2019 Acreage Survey."

Fennimore, S., Duniway, J., Browne, G., Martin, F., Ajwa, H., Westerdahl, B., and C. Winterbottom. (2008) Methyl bromide alternatives evaluated for California strawberry nurseries. *California Agriculture*, 62(2), 62-67. <https://ucanr.edu/repositoryfiles/ca6202p62-65598.pdf>

Klonsky, K. and B.D. Healy. (2013) Statistical Review of California's Organic Agriculture (2009-2012) <https://aic.ucdavis.edu/2013/10/01/statistical-review-of-californias-organic-agriculture-2009-2012/>

Koike, S.T., Bull, C.T., Bolda, M., and O. Daugovish (Eds.). (2012) "Organic Strawberry Production Manual," *University of California Agriculture and Natural Resources*.

Pew Research Center. (2016) "The New Food Fights: U.S. Public Divides Over Food Science"

University of California Agriculture and Natural Resources. (1999) "Crop Profile for Strawberries in California." <https://ucanr.edu/datastoreFiles/391-501.pdf>

US Environmental Protection Agency. (2015) Protection of Stratospheric Ozone: 2016 Critical Use Exemption from the Phaseout of Methyl Bromide, 40 C.F.R. § 82. <https://www.epa.gov/ozone-layer-protection/ozone-depleting-substances>

Wilhelm, S., J.E. Sagen, and H. Tietz. (1974) "Resistance to Verticillium Wilt in Cotton: Sources, Techniques of Identification, Inheritance Trends, and the Resistance Potential of Multiline Cultivars," *Phytopathology*, 64: (924-931).

## Appendix A Factsheet (Also available in Spanish)



### Organic Strawberry Fields Forever: From Start to Finish

Organic agriculture is rightfully known as an important contributor to combatting a wide range of global human health and environmental problems. It protects our air, land and water by eliminating the most poisonous chemicals from agriculture and by using substantially less fossil fuel than conventional industrial agriculture. Organic practices mitigate the adverse effects of climate change by sequestering carbon, improving soil water-holding capacity, and regulating soil temperatures so crops can survive droughts, floods, and extreme temperatures. But, all aspects of organic systems are not perfect. That is why drafters of the Organic Foods Production Act (OFPA) allowed ample room for continuous improvements. An area still in need of improvement is the development of organic nursery planting stock (starts).

#### Organic Strawberry Industry's Dilemma

Sought after as a tasty, healthy, nutrient-dense food, organic strawberries contribute to both environmental degradation and protection. That is because all commercial organic strawberry farmers grow their fruit from conventional starts. Even though their land and growing practices are certified organic, organic strawberry farmers must purchase conventional starts grown in soils that have been injected (fumigated) with highly toxic pesticides to kill pests – they have no other option. Until the launch of the *Organic Strawberry Fields Forever* Project, there were no commercial organic strawberry nurseries in the entire U.S. Organic Advocacy is leading the charge to stimulate the development of new organic nurseries and to assist the organic strawberry industry in transitioning to organic starts.

**An estimated 80 million organic starts are needed to transform the entire organic strawberry industry in California alone. Annual releases of approximately 1.3 million pounds of the most hazardous pesticides will be eliminated once organic starts become the norm in California,<sup>6</sup> ending the organic strawberry industry's contribution to the associated health, environment, and climate warming impacts.**

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<sup>6</sup> Bolda, M. UC Cooperative Extension, Strawberry and Caneberry Farm Advisor. Personal Communication. Nov. 29, 2016.

### No Organic Strawberry Starts?

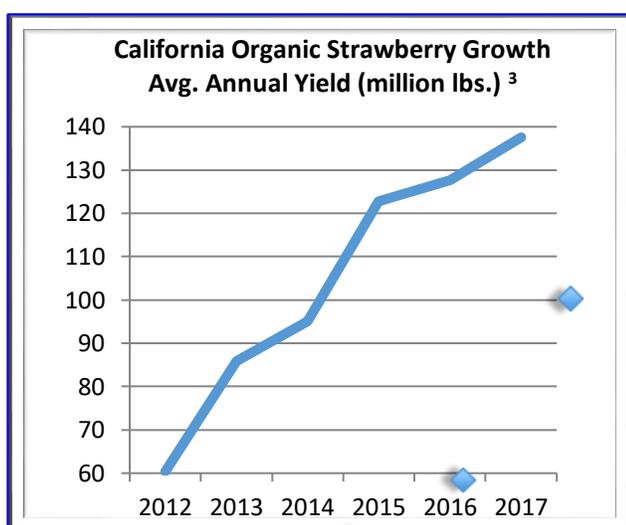
The lack of organic starts has put organic strawberry farmers in a difficult position of being forced to farm with conventional starts. USDA's National Organic Program has allowed this practice to continue, virtually unchecked, under the organic regulation's "commercial availability" clause. The clause was intended to facilitate organic starts and seeds development, but that has not happened in the organic strawberry sector. Since regulations do not mandate a deadline for eliminating conventional starts, no market pressure or incentives exist to stimulate organic production. In fact, for over 28 years since the passage of OFPA, organic strawberry farmers have used conventional starts – because they have no other choice!

### Methyl Bromide, Chemical Warfare and Organic Strawberries?

Fumigating soils to combat pathogens, insects, and weeds with methyl bromide (MeBr) and the chemical warfare agent, chloropicrin, became the standard strawberry nursery practice in the 1950s. But their use carried a high social cost. MeBr gas has 5 times the global warming potential of carbon dioxide. Its release from farms has caused 5-10% of world's ozone depletion,<sup>7</sup> increased UV radiation and elevated skin cancers. This motivated countries to ban it by 2005, under the Montreal Protocol. U.S. strawberry nurseries, however, received "critical use exemptions" to continue MeBr fumigation until 2017. No environmentally sound chemical substitutes have emerged. Chloropicrin (a vomit gas used during World War I and II) and Telone are the most widely used fumigants now. Both are banned in the EU due to their extreme toxicity. Exposure to those fumigants can severely burn the skin and eyes and damage the lungs, kidney, liver, brain and nervous system of workers, bystanders and wildlife.

### Organic Strawberry Fields Forever – A Game-Changer

When California's Department of Pesticide Regulation (DPR) withdrew the proposed chemical substitute for MeBr, methyl iodide, because it is four times more acutely toxic, Dr. Lisa J. Bunin approached pioneer organic strawberry farmers to help forge a solution. Under the auspices of the *Organic Strawberry Fields Forever* Project (OSFF), in 2013 she convened an Organic Strawberry Summit of organic farmers, researchers, government regulators and NGOs to discuss the imperative of ending the organic strawberry industry's contribution to the use of MeBr and other toxic soil fumigants. Strategizing at subsequent meetings led to jump-starting organic strawberry nursery production and the founding of Innovative Organic Nursery, LLC (ION) in 2016.



ION produced 775,000 public and private varieties of organic starts for the 2018/19 growing season. Field trials of the starts are being conducted at organic farms in Santa Cruz, San Mateo and Monterey counties. Organic Advocacy is coordinating the project and Farm Fuel, Inc. is collecting and analyzing the data, supported by a grant from the Organic Farming Research Foundation (OFRF).

Crediting OSFF for leading the switch to organic starts, Driscoll's, the world's largest organic strawberry company, announced that it will use only organic starts by 2020. While beneficial for human health and the environment, this move does not help independent and family farmers who cannot purchase the proprietary varieties. OSFF is filling this gap by pursuing the development of *public starts* for all growers.

<sup>7</sup> USEPA. (N.D.) Ozone Depleting Substances. <https://www.epa.gov/ozone-layer-protection/ozone-depleting-substances>

### Growth Market with an Impact

California's organic strawberry farmers produce 142 million pounds of berries annually,<sup>8</sup> adding \$93.6 million to the state's economy.<sup>9</sup> Their farms occupy 4,170 acres — which more than doubled in the past 5 years — representing 13.1 % of California's total strawberry acreage.<sup>10</sup> Expanding production of public varieties of organic strawberry starts presents a tremendous, unmet market opportunity that is essential for transforming the industry, nationwide.

**The goal of this farmer-led project is to transition California's organic strawberry industry away from using conventionally grown, chemical-intensive starts to exclusively using organic starts.**

### Game Plan

- Facilitate the development of public varieties of organic strawberry starts at nurseries at multiple locations.
- Coordinate field trial data collection and analysis, farm tours and widespread publication of results.
- Inform consumers about the positive changes underway in organic strawberry production.
- Outreach to organic strawberry farmers to enlist them to grow organic starts and help transition the industry!

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<sup>8</sup> Based on 34,000 pounds average yield per acre. Bolda M. et al. (2014) UC Cooperative Extension.

[https://coststudyfiles.ucdavis.edu/uploads/cs\\_public/94/4b/944b5aad-6660-4dcd-a449-d26361afcae2/strawberry-cc-organic-2014.pdf](https://coststudyfiles.ucdavis.edu/uploads/cs_public/94/4b/944b5aad-6660-4dcd-a449-d26361afcae2/strawberry-cc-organic-2014.pdf)

<sup>9</sup> Klonsky & Healy. (2013) <http://aic.ucdavis.edu/2013/10/01/statistical-review-of-californias-organic-agriculture-2009-2012/>

<sup>10</sup> California Strawberry Commission. (2019) "California Strawberry 2019 Acreage Survey."

## Appendix B

Article featuring OSFF farm and farmer



**OPN**<sup>TM</sup>  
Organic Produce Network

OPN Connect Newsletter 134 · September 26, 2019

## Javier Zamora's JSM Organics, Serving the Community and Organic Agriculture

In 2012, Javier Zamora graduated from ALBA, a 100-acre training facility that teaches hard-working, low-income farm workers and aspiring farmers seeking a better life through growing organic fresh produce and began farming 6 acres of row crops. Today, the charismatic grower farms 75 acres producing 25 different crops and employing 20 full time and 30 seasonal workers.



*Javier Zamora, JSM Organics*

OPN recently joined California Congressman Jimmy Panetta's agriculture staffer, Riya Mehta, and CCOF to visit Zamora's operation to get a firsthand look at his organic production.

**Zamora takes great pride in his organic strawberry production. He selects varieties like Mara Dubois that has quite a following with retailers because of their taste profile. One of his challenges was the lack of organic**

**strawberry starts that were available commercially, with most organic growers having to purchase starts from conventional nurseries.**

To that end, Zamora has been actively involved in the Organic Strawberry Fields Forever project, he was all in. Javier told OPN that, “I heard about this project with Lisa Bunin, and I wanted to be part of it.”



*Lisa Bunin, Director, Organic Advocacy*

**Bunin, director at Organic Advocacy, who helped spearhead the project said “Javier planted conventional and organic starts side by side and the results were comparable in yield, the size of the plant and with no wilt. It’s our intention to kick start the industry into using organic starts, as Javier has done.”**

“Some farmers are reluctant to make the change because conventional starts are working well,” Bunin said. “This is why the field trials are so important. Data taken from local farms helps farmers feel confident about making the switch. Organic starts are already commercially available so certifiers like CCOF will be requiring organic strawberry growers to plant them this fall.”

When not busy farming and mentoring aspiring organic growers, he actively serves the local community, working to foster greater opportunities and understanding of organic agriculture.



*Pam Krone, agricultural water quality coordinator, CMSF*

**Walking through Zamora’s lower fields, OPN met Pam Krone, agricultural water quality coordinator for the California Marine Sanctuary Foundation (CMSF). One of CMSF’s goals is to support the Monterey Bay National**

**Marine Sanctuary by preventing agricultural pollutants from entering the Sanctuary and to also look for positive ways' agriculture can influence marine ecosystems.**

The California Marine Sanctuary Foundation received a grant through CDFA's Healthy Soils Program to run a demonstration project to implement farming practices that sequester carbon dioxide into the soil, which in turn increases soil organic matter and improves soil health.

Zamora contacted Krone when he heard about the project. "By having this demonstration project, Javier can show other farmers how organic practices such as cover crops and compost can impact their farming operations, improve and benefit the soil, and increase yields. Building healthier soil with more carbon content helps the marine sanctuary by removing carbon dioxide from the air," Krone said.



**Planting a hedgerow under NRCS Conservation Project**

Another project Zamora has fully embraced is Hedgerows Unlimited. The brainchild of Sam Earnshaw, Hedgerows Unlimited locates, designs and installs conservation plantings including hedgerows, windbreaks, field borders, riparian plantings and grassed waterway for farmers.

**Earnshaw said Zamora has played a pivotal role in utilizing Hedgerows Unlimited services. "Javier applied to NRCS for a conservation project and we're installing three hedgerows along the edge of his fields. They will provide habitat for beneficial pollinators, insects birds and wildlife, Earnshaw said., "By planting native shrubs and flowers Javier will satisfy his desire to increase biodiversity. He always thinks in the bigger picture and is committed to incorporating nature and biological processes into his system of growing crops."**



*Sam Earnshaw, founder, Hedgerows Unlimited*

Zamora also serves on the ALBA board, Eco-Farm Board, CCOF Central Coast Chapter, Pajaro Valley Water Agency and on the USDA Small Farmer and Rancher Advisory Committee.

**“Javier really is a stakeholder and a good citizen who does everything he can to work harmoniously with the environment and the community. He is a pioneer willing to test new ideas and to share his knowledge with the agricultural community,” Krone said. Some farmers I approached for the project didn’t want the liability of having visitors on their land, a requirement for the demonstration aspects of the grant. Javier’s a natural leader and loves sharing with local growers.”**

## Appendix C

### OSFF Project Photos



**Fernando from Farm Fuel shows how we mapped the field trials. The area taped off in blue designates the organic transplants and the orange taped-off area designates the conventional transplants.**



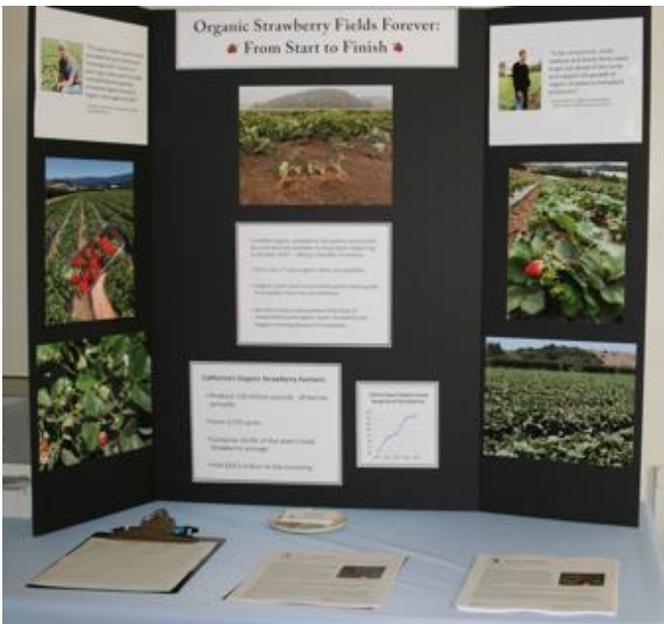
**Tom Broz at the organic strawberry field trial site at his Live Earth farm.**



**Flor Revolorio at the organic strawberry field trial site at Pie Ranch.**



First harvest of organic strawberries from the start at Swanton Berry Farm.



OSFF Project Display at FFI strawberry meeting.