Vegetable Info (February 2025)

In this issue:

- **Presentations** from the 2025 S. Sacramento Valley Processing Tomato meeting online
- **2024 season review:** Fungal diseases, viruses, abiotic issues, boron
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- **Broomrape Control Board** seeks input

Upcoming opportunities

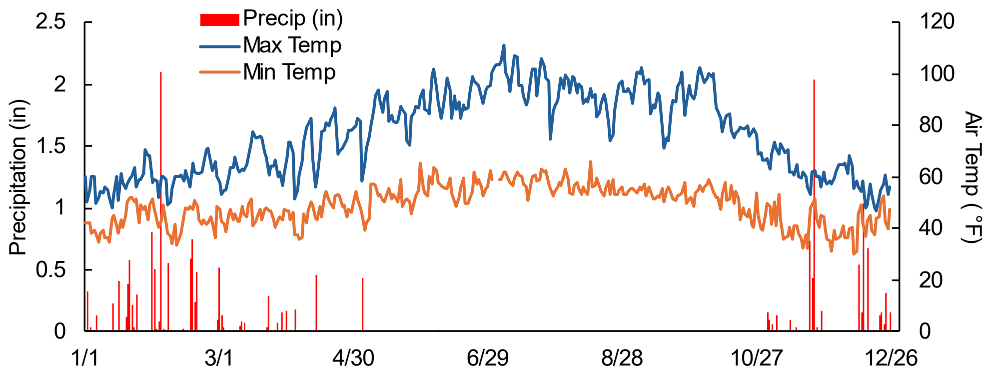
- Farm & Ranch Succession Planning Workshop (2/13)
- Restore Grant from Zero Foodprint (Due 2/19)
- Organic weed management seminar (3/4)

Presentations from the 2025 south Sacramento Valley processing tomato production meeting, held on January 14, are available online:

- 2025 Tomato Meeting Agenda -Thank-You to Meeting Sponsors
- 2024 Broomrape Research Trials--Matt Fatino, Brad Hanson
- What's new: best cleaning practices for managing broomrape spread on field equipment--Cassandra Swett
- Regional disease updates for the Sacramento Valley-2024--Cassandra Swett
- Fusarium stem rot and decline (FRD): host range and rotation guidelines--Myles Collinson
- Chemical and varietal approaches to FRD management--Patricia Lazicki, Brenna Aegerter
- Yolo County Regulatory updates and reminders--Molly Matthews
- 2024 Sacramento Valley Processing Tomato Summary--Scott Picanso
- Diagnosing Herbicide Symptoms--John Roncoroni
- Controlling in-row weeds with post-plant applications of pre-emergent herbicides--Scott Stoddard
- Consperse Stink Bug--Tom Turini
- An update in the Spotted Wilt Virus Situation--Tomas Melgarejo

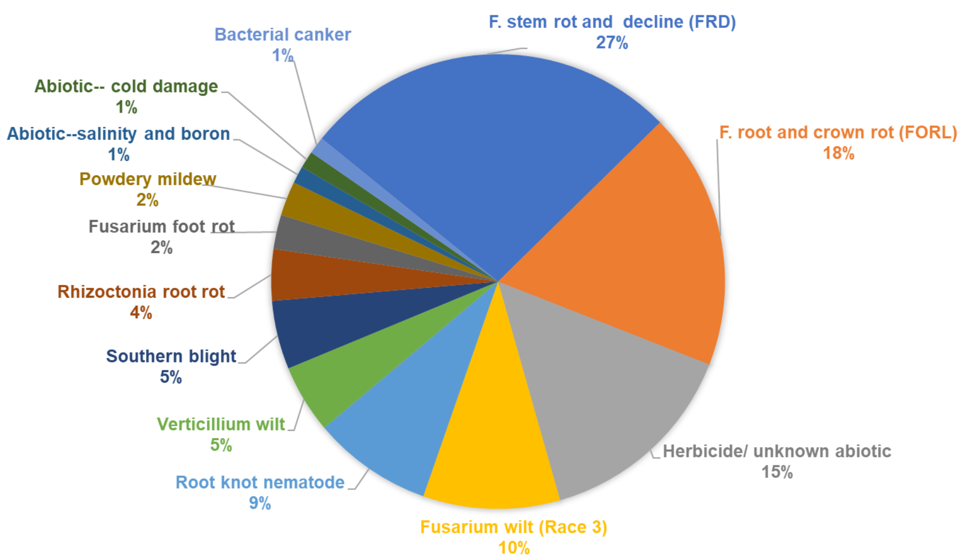
2024 season review

2024 was an interesting weather year—a rainy winter and cool spring, followed by record heat waves in late June/early July and sustained heat towards the end of the season.



Daily precipitation and air temperatures in 2024, recorded at the Davis CIMIS station

The chart below shows results of samples brought in for diagnosis from 2024 tomato field trials and farm calls, mostly from Yolo, Solano, and Sacramento counties, with a few from Sutter and Colusa. They include diagnoses from trials specifically targeting Fusarium stem rot and decline, and so are not meant to be a representative survey. They do not include tomato spotted wilt virus (TSWV), which occurred at trace rates (<1%) in most fields I was in.



Tomato diagnoses from field trials and farm calls in the south Sacramento Valley, 2024 season. *Single fields often had multiple pathogens present. More detailed information on 2024 disease diagnoses from the southern Sacramento Valley can be found here:* [*https://ucanr.edu/sites/ccvegcrops/files/406327.pdf*](https://ucanr.edu/sites/ccvegcrops/files/406327.pdf)

Fungal diseases

Fusarium diseases remained widespread in local processing tomato fields in 2024. A little more than a quarter of the fields we diagnosed in 2024 had fusarium stem rot and decline (FRD, caused by pathogens in the *F. falciforme* complex). This disease is difficult to manage because as yet there is no varietal resistance. Field trials conducted in FRD-infested fields since 2019 have found that fungicides are not always effective. Of the chemical management approaches tested, fumigation with K-Pam has most reliably increased yields. However, it is expensive and not always effective.

	Site	UC Davis	Yolo Co.	San Joaquin Co.	San Joaquin Co.	San Joaquin Co.	Yolo Co.	Solano Co.	San Joaquin Co.	Yolo Co.	Yolo Co.
	Year	2019	2019	2019	2020	2021	2023	2023	2024	2024	2024
	Disease	FRD	FRD	FRD	Fol & FRD	Fol & FRD	Fol, FRD, Forl, s. blight	FRD, Forl	RKN & FRD	FRD, vert	FRD
Product	Vine decline in non-treated control	47%	73%	20%	31%	30%	55%	16%	19%	18%	21%
K-Pam ~30 gal	*Disease*				+	++	*NS*	++		*NS*	-
	Yield			7.2 t/a	*NS*	26 t/a	4.7 t/a	3.5 t/a		*NS*	7.5 t/a
K-Pam ~15 gal	*Disease*		*NS*		+	++					
	Yield		11.9 t/a		*NS*	13.6 t/a					
Miravis	*Disease*	+			+	++					
	Yield	*NS*			*NS*	9.2 t/a					
Rhyme	*Disease*				+	++			*NS*		
	Yield				*NS*	10 t/a			*NS*		
Velum	*Disease*	+			-				*NS*		
	Yield	*NS*			*NS*				*NS*		
	Disease *P*-value	*NS*	*NS*	*Not tested*	*P=0.06*	*P=0.0004*	*NS*	*P=0.008*	*NS*	*NS*	*P=0.04*
	Yield *P*-value	*NS*	*P=0.01*	*P=0.016*	*NS*	*P=0.015*	*P=0.05*	*P=0.01*	*NS*	*NS*	*P=0.0006*

+=statistically weak positive effects ++=statistically strong positive effect; NS=not significant

Results of chemical trials in FRD-infested fields since 2019. Fol= fusarium wilt, RKN=root knot nematode

While no varieties are resistant to FRD, ongoing variety trials in FRD-infected fields in the south Sacramento Valley and northern Delta region have found that some varieties consistently show less decline than others.

More tolerant varieties (performed better than average in >10 trials conducted in FRD-infested fields)
SVTM 9016; SVTM 9037; SVTM 9019; HM 8237; N 6428; SVTM 9041; HM 58841*

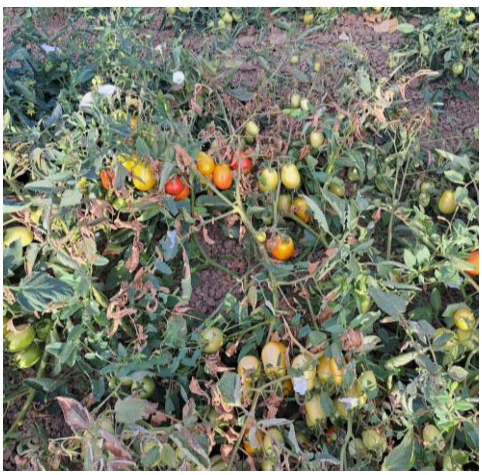
**Note that HM58841 is not resistant to Fusarium wilt Race 3, and is not an appropriate choice where this disease is present.*

Consult with your seed retailer about your particular situation. A complete summary of the 2024 chemical and variety trials can be found here: https://ucanr.edu/sites/ccvegcrops/files/393793.pdf

Declined plants in a variety trial conducted by TS&L (left) and a replicated trial to identify FRD-tolerant varieties conducted by AgSeeds (right). Both were in FRD-infested fields, and the field variety was HM58841. Photos taken about 2 weeks before harvest.

However, significant decline can occur even in fields planted to these more tolerant varieties. Fields can accumulate disease pressure over time, reducing yield potential. After a year of high losses from FRD, it's recommended to rotate to a non-host crop. Recent studies from UC Davis suggest that of local rotation crops, corn, wheat, barley, cucumbers, melons, onions and garlic are safer choices. Sunflower is a severe host of FRD—not only does the pathogen multiply in the soil, but FRD may reduce seed yield. Safflower is a mild host—the pathogen multiplies in the soil but yield is likely not affected. More information on potential hosts can be found here: https://ucanr.edu/sites/ccvegcrops/files/406328.pdf

Many samples were diagnosed as **fusarium crown and root rot** (FORL, caused by the pathogen *F. oxysporum f.sp. radicis-lycopersici*). This disease can't be definitively diagnosed by routine lab DNA sequencing, so these are tentative pending further analysis. I was in many fields following the heat wave where I noticed a tendency of rapid leaf necrosis starting from the lowest leaves, sunburned stems and fruit, and in some cases almost complete vine decline earlier in the season than I would expect from a fusarium disease. Lab diagnosis from these fields were often identified as tentative FORL, sometimes along with another soil-borne fungal disease. It's interesting that this severe decline happened following the heat wave, since FORL is thought to be associated with cool soil temperatures, ammoniacal nitrogen, and waterlogged soils. It's possible that infection happened during the cool, rainy spring.




Local field diagnosed (tentatively) as FORL. I saw many fields with similar symptoms (necrotic lower leaves, sparse canopy, and stem bronzing on declining plants, in a patchy, random pattern in the field).

Southern blight (caused by the fungal pathogen *Sclerotium rolfsii*), is another disease that I saw more of in 2024, both in tomato and pepper. Since it's favored by hot weather and relatively moist conditions, it's not surprising that it showed up in 2024. Several growers have said that it's becoming more of an issue for them in recent years than it has normally been in the past. Given that extreme heat events are predicted to increase and that southern blight has a large host range, can survive for at least five years in the soil as sclerotia, and has few good management options, it's definitely something to watch out for.

It's most common at the tail end of fields, in furrow-irrigated fields, or in other situations where water is present close to the soil surface. The best management tool we currently have is careful irrigation-- that is, to supply the needs of the crop without wetting the top of the bed, since infection is most likely when soil near the plant crown gets wet during hot weather. Practices that reduce the soil load transported on equipment between fields (e.g. pressure washing) may help reduce spread of the pathogen to new fields.

Southern blight in local tomato and pepper fields. Southern blight often occurs as patches of wilted or declined plants along a row in wetter areas of the field. The diagnostic sign is the presence of sclerotia (hard structures, about the size and shape of alfalfa seeds) around the crown. They don't always occur, especially on tomatoes. Thick white fungal growth around the crown is often present. However, some fusarium diseases also produce a similar growth.

Viral diseases

Viruses were less of a problem in 2024 than fungal diseases. Resistance-breaking tomato spotted wilt virus (TSWV) is still present—I saw at least a few plants with TSWV in nearly every field that I visited, and Bob Gilbertson's virology lab at UC Davis identified all as being aggressive, resistance-breaking strains. However, there was relatively little spread within fields, even in known hotspots near fields which were severely affected in 2023. We hear that more growers are starting to manage early for thrips, the vector for TSWV, which likely contributed to this. Additionally, the thrips present may have been poor vectors: the Gilbertson lab unexpectedly determined that most of the thrips caught on our monitoring traps were onion thrips rather than western flower thrips, which is the most common vector. Onion thrips can still vector TSWV, but they are less efficient than western flower thrips. We will continue to monitor thrips and TSWV incidence in 2025. I will be posting regular monitoring updates, as well as growing degree day model predictions of thrips populations, at the Yolo/Colusa Thrips blog (https://ucanr.edu/blogs/ThripsTSWVYoloColusa/index.cfm)

Like 2023, 2024 was another very low beet curly-top virus (BCTV) year. We monitored high-risk fields in areas which were impacted in the 2021 outbreak. Very few beet leaf-hoppers (the vector of BCTV) were trapped in our monitored fields, with almost none carrying the virus. We found no infected plants. It's likely that the 2021 outbreak was associated with the dryness of the preceding winter, perhaps causing unusual leafhopper migration up to the northern areas. More info on 2024 TSWV and BCTV in 2024 can be found here: https://ucanr.edu/sites/ccvegcrops/files/406335.pdf

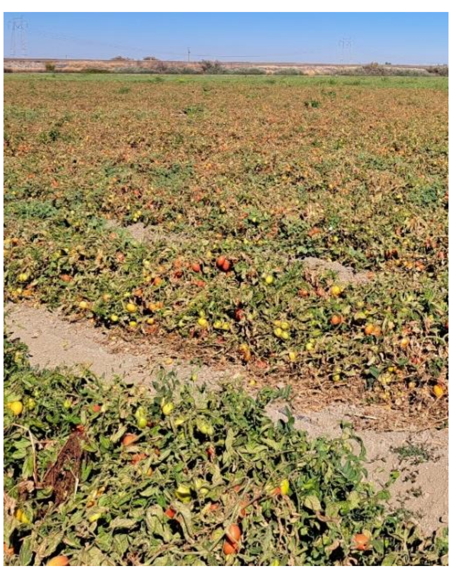
Abiotic issues

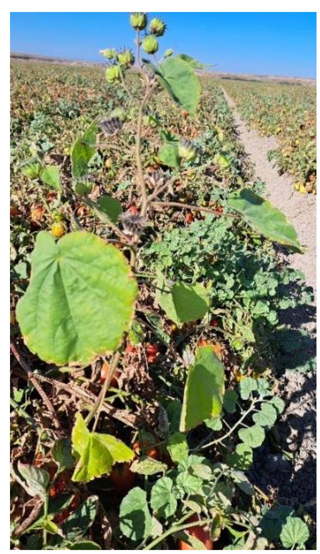
Compared with 2023, I had many more calls on issues which turned out to be abiotic. Many of these involved young transplants. Diagnostics labs at UC Davis did not identify pathogen presence. In the fields where it was not necessary to replant, transplants generally were able to put on healthy new growth and grow out of it. This is generally a sign of an abiotic shock such as herbicide damage, although in most cases there wasn't an obvious culprit (in one case, the field was organic). The cause remains a mystery. This is an issue I'll be monitoring closely in 2025.


Example abiotic damage on a field of young transplants. Symptoms (not all evident on every plant) included leaf chlorosis and necrosis, a distorted appearance, pinched lower stems which looked similar to heat damage but occurred in weather where heat stress was unlikely, and shiny, dark green lower leaves. No biotic cause was detected.

Case study: how much boron is too much?

High boron occurs naturally in the Cache Creek watershed. Tomato is a relatively boron-tolerant crop. How high can boron concentrations be before they become yield limiting? I got a call to come look at a field with a widespread issue. From a distance, the field looked uniformly brown. A closer look at the leaves showed tip burn, marginal curling and necrotic lesions. These are all typical signs of B toxicity, but may be caused by salinity as well. The symptoms were evident in the tomato plants, as well as other plants (velvetleaf weeds and some melons in an adjacent field. However, the tomato vines were vigorous.





The field was irrigated with surface water.

Results of irrigation water test, compared with general irrigation water quality thresholds

	pH	EC (dS/m)	Ca (meq/L)	Mg (meq/L)	K (meq/L)	Na (meq/L)	Ca/Mg	SAR (Calc)	SAR/EC	Adj. SAR (Calc)	Cl (meq/L)	B (mg/L)	HCO_3 meq/L
Water test value	7.4	2.05	4.3	5.5	0.13	**9.59**	**0.78**	4.33	2.11	**11.3**	5.9	**4.19**	**8.35**
"Severe limitations"[$]		>3				>9	<1		>10	>10	>10	>3	

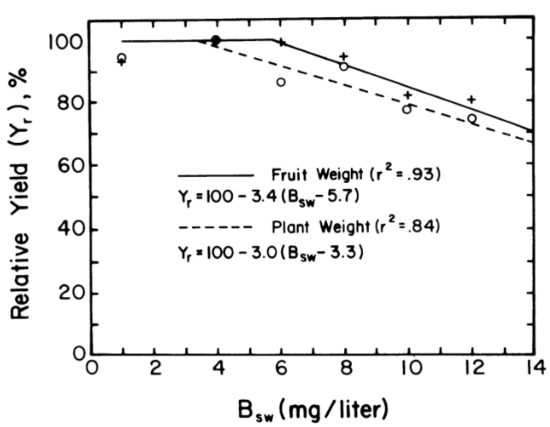
[$] Snyder et al., 2023; "Irrigation Scheduling" In Ayers et al., 2023 *Micro-irrigation for Crop Production, 2nd Ed.*

Values for irrigation water quality from a recently published microirrigation guidebook (Snyder et al. 2023) suggest that the irrigation water sodium (Na) and B levels could pose severe restrictions for most crops. Additionally, the salt chemistry of the irrigation water may limit its movement in the soil by dispersing soil structure. The sodium absorption ratio (SAR) is calculated from the relationship of Na (which destroys soil structure) to calcium (Ca) and magnesium (Mg), which help bind soil particles together. Ca is particularly important for good structure and drainage. In this irrigation water, SAR is not particularly high. However, the adjusted SAR takes into account the bicarbonate (HCO_3) content, as this can precipitate with Ca, limiting Ca's ability to react with the soil. In this water source HCO_3 is high; the test lab where the sample was analyzed suggests a threshold of >3.2 meq/L. Additionally, this water source is high in Mg, and when the ratio of Ca to Mg is low, Mg can also contribute to soil dispersion. The high adjusted SAR and low Ca/Mg ratios both suggest water quality may be interfering with water movement in this soil.

Soil and leaf sample values

	EC	Boron
Soil samples (saturated paste extract)	5.9 dS/m	3.9 mg/L
Leaf sample (young mature leaf)	N/A	487 mg/kg

Soil samples were taken from the top 12" of soil, about 5-10 inches from the center of the bed. The soil test guidelines published by UC IPM suggest that B becomes limiting at around 5 mg/L in a saturated paste extract from the top foot of soil, while salinity is considered high when EC of a saturated paste extract exceeds 4 dS/m. Using these thresholds, B is probably not limiting but soil salinity may be.



Relationship between B concentration in the soil solution and relative yield in tomatoes (Francois, 1984)

Samples of recently matured leaves taken from throughout the field had an average concentration of 487 mg B/kg. An open-field sand culture experiment found that when fresh-market tomatoes were grown in a soil solution containing 4 mg B/L, boron levels in young, mature leaves ranged from about 320-420 mg B/kg. At that level, the leaf tissue showed marginal necrosis and plant weights were slightly reduced, but the fruit yield was not yet affected.

Water, soil, and plant tissue tests suggest that boron in this field is likely contributing to the observed leaf injury, but may not yet be at yield-reducing levels. However, soil salinity is high enough that it may be yield-limiting. Additionally, the water quality might be limiting water movement in the soil, which could cause salinity and B concentrations to increase over time. Acidifying the irrigation water to prevent bicarbonates reacting with Ca could help improve water movement in the soil.

2024 Transplanter Trial Part II: Cost-Benefit Analysis

I. Experimental overview

Automated planters are able to plant more quickly with less labor than traditional planters. Three replicated side-by-side field trials in Yolo, Solano, and Sacramento counties found that among the four planter types tested (a finger planter and a Ferrari FMAX carousel-type planter, and two automated planters: the Ferrari Futura and the Agriplanter), there was no evidence that planter type affected yields or quality under a range of normal planting conditions in the south Sacramento Valley. Click here to see the full report: https://tomatonet.org/wp-content/uploads/2024/10/2024-Transplanter-Trial-Informal-Report.pdf.

However, automated planters are also more expensive than traditional types, and have some different logistical challenges. In the second part of this study, a combination of observations from the trial and interviews with equipment distributors, growers and custom planters was employed to do a cost-benefit analysis for the different planter types. Results include:

1. A table comparing average selected costs for each planter type
2. A more detailed matrix of purchase, labor, and maintenance costs, as case studies from two custom planting operations
3. An analysis of strengths, weaknesses, opportunities, and threats associated with each

Since the associated costs of running each machine depend on operational conditions and decisions which differ among operations, the costs presented try to reflect as closely as possible only those directly associated with the intrinsic needs of the machine in question (e.g. the cost of the planter is included, but not the tractor). Also, since automated planters are only used by a few growers, the information for each machine is based the experience of one or two growers or custom planters. So, these numbers should be treated more like case studies of individual operations rather than representative, comprehensive costs.

II. Methods

In consultation with Dr. Brittney Goodrich, an agricultural economist formerly working with the UC Davis Cost & Return Study team (now working for the University of Illinois), two surveys were developed. One contained questions for the manufacturers and distributors, and the other for growers or custom planters with experience using the machine in question. In the case of the Futura, the custom planting business is also the US distributor for Ferrari, so in this case the two questionnaires were administered to the same team (MTD Transplanting). Other interviewees were Eric Puehler (of Puehler Ag, the US distributor for AgriPlanter), and Ray Yeung, who uses the AgriPlanter, FMAX, and finger planter in his custom transplant business and on his own farm. I also interviewed a grower who is using the 5-row configuration of the AgriPlanter, although this was not a part of the field study, given local interest. I received additional input from two local growers using the 3-row AgriPlanter.

Surveys contained questions concerning costs such as purchase price, labor needs, maintenance costs, and resale value (Table 1), as well as more general questions about special challenges associated with the machine, or conditions under which it performed especially well or poorly. Since the automated planters are relatively new some information which would be part of a formal cost study, such as lifespan and end-of-life resale value, are not available.

III. Results

Table 1. Planter speed, crew size, and calculated acres per man-hour as observed in the field trials

	AgriP 3-row	Futura 3-row	FMAX 3-row	Finger 3-row
Speed (mph; measured from 2 passes, 1 turn)	1.4 - 2.8	1.0 - 1.3	0.79 - 1.1	0.8 - 1.4
Crew size*	2 - 3	2	5 - 6	8 – 10
Acres/ man-hr (active time)**	1.3 - 2.5	0.9 - 1.3	0.3 - 0.4	0.2

* As observed at field trials. Not including water truck and forklift operators

** Calculated using observed crew size, pass length, and measured speed over 2 passes and one turn (3 replicates in 3 fields, n=9).

Estimated costs, from grower & distributor interviews. ***Costs reflect only those directly associated with the machine itself, not the full cost of the planting operation.*** *Calculations exclude forklift/water truck operator.*

		AgriP 3-row	Futura 3-row	FMAX 3-row	Finger 3-row
	Acres per shift (seasonal avg)*	16 – 30	10 – 20	10 - 11	11 - 12
	Shift length (hr)	10 – 12	8	8 - 8.5	8 - 8.5
	Acres/ man-hr (seasonal avg)**	0.5 - 0.9	0.4 - 0.8	0.2 - 0.3	0.1 - 0.2
	Avg crew wage($/hr)***	$80	$80	$137	$205
	Avg labor cost ($/acre)	$29 – 44	$32 – 43	$100 - 117	$137 - 145
	Estimated diesel cost ($/acre)$	$5.44 - $7.25	$7.16	$4.63	$3.86
	Estimated maintenance cost ($/acre)$$	$3.00	$5.10	$4.50	$7.00
	Total average running costs ($/acre)	**$45.85**	**$49.76**	**$117.63**	**$151.86**
Cost per acre (5-year depreciation schedule)	Example purchase price	$352,000	$198,000	$63,000	$7500 (used)
	1000 acre/yr	$116.25	$89.36	$130.23	$153.36
	1500 acre/yr	$92.78	$76.16	$126.03	$152.86
	2000 acre/yr	$81.05	$69.56	$123.93	$152.61

*Grower and distributor-reported seasonal estimate (integrates breaks, cleaning, maintenance)

** Calculated using grower estimates of daily acreage, crew size, and shift length; not including water truck/forklift
Assumes 3 crew on automated planters

*** Calculated using averages of grower-reported wages for farm and contract labor
(Contract wage: base: $16; supervisor: $18; contract fee: 42%. Farm wage: base: $19, machine-operator: $22; benefits: 35%)

$ Calculated using grower reported diesel usage (per hour or per acre), California 5-yr average diesel cost of $4.63/gal

$$ As reported by Ray Yeung (AgriPlanter, FMAX, Finger) and Todd Diederich and Brad Strock (Futura)

Table 3: Operational case studies from two custom planting operations (MTD Transplanting & Kubo Yeung Farms)

		Futura (3 row)	AgriPlanter (3-row)	FMAX (3-row)	Finger planter (3-row)
Purchase & equipment	Purchase costs	$198,000 (includes training)	$335,811 - $368,195 (lower costs for purchases Jan-May; includes training)	$63,000	~$7500 at auction.
	Weight	4500-4600 lb	~7500 lb	~3000 lb	~3000 lb single-line, 4500 lb double-line
	Tractor needs	70-90 hp, 540 PTO and 3-point hitch	160-175 hp; PTO depends on what grower wants to carry for water (200 for 1000 gal)	125 hp	125 hp
	Additional equipment	Common add-ons include rubber rollers to promote good soil-plug contact, custom built bin rack	Requires a variable-rate GPS, pressure washer for regular cleaning, appropriate pump	Quick hitch	
	Updates	Most updates are to the software, and the cost to the consumer is minimal	Currently supplied at-cost through distributer		
Speed & labor	Crew size	2-4 (1 driver, 1 crew on own farm; more if using for custom planting)	3 (driver, 2 on machine)	5.5 (1 driver, 3 contract labor planting, 1 supervisor. Mechanic, half-time)	8.5 (1 driving, six contract labor planting, 1 supervisor. Mechanic, half-time)
	Acres / day	10-20 acres per 8-hr day	16-20 acres per 10-hr day	10-11 acres per 8-hr day	11-12 acres/8-hr day
	Acres/ man-hr	0.4 - 0.8 (assumes 3-man crew)	0.5 - 0.7 (assumes 3-man crew)	0.2 - 0.3	0.18 - 0.19
	Avg labor cost/acre	$44/acre	$41/acre	$109/acre	$142/acre
	Reasons for a slower day	Higher planting density, short field length	Cracked/broken trays. When they first started the average was closer to 13-15 acres per day, but speed has increased as they learn how to run it better, make adjustments	Tall, tangled plants; poor plant quality	The machine rarely has problems; the more important issue is managing the people and cars
Inputs & maintenance	Diesel (estimated)	Diesel use estimated about 1.5 gal/acre (~4-4.5 gal/hr). Hauled by 90 hp tractor.	Diesel use estimated 22-25 gal/day; 1.2-1.5 gal/acre at 16-20 acre/day. Hauled by 160 hp tractor.	Estimated diesel use is about 0.95 gal/acre; hauled by 125 hp tractor.	Estimated diesel use is about 0.8 gal/acre; hauled by 125 hp tractor.
	Seasonal maintenance	~$5 per acre. Replacement shoes are the only regular wear item, at $320 per row, replaced about every 200 acres	~ $3.00/acre . Bearings, belts are regular replacement items. Shoes are about $400/row, replaced about every 2500 acres	~ $4-5/acre; shoes are regular replacement items	~$7/acre (rubber plant holders, chains, fingers, shoes, guides, wheels)
	Service visits	Service visits are $130-$180 per hour, but they have not had any issues yet that can't be fixed with a phone call	The distributer comes to do the winterazation, at a charge of $200/hr. The bill for a major servicing, after around 5000 acres of use, was $5000-$6000	Service visits haven't been needed	Service visits haven't been needed

A SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis to capture less quantifiable issues. This analysis summarizes internal (strengths, weaknesses) and external (opportunities, threats) factors which may positively and negatively affect machine's success

Agriplanter:

Strengths: Highest measured speed of all planters in this study, lowest per-acre operational cost (particularly for the 5-bed model). High speed also means fewer engine-hours on the tractor. Low labor requirement, good customer support, uses standard trays. May require less water than finger planter. Rapidly developing technology; updates made available at cost to existing customers. High degree of adjustability (specialized expertise is needed and there's a learning curve, but distributer willing to work closely with the grower).	**Weaknesses:** Cracked trays greatly reduce speed and performance; also has some difficulty with non-uniform/ leggy/ saturated plants. Higher skip rate than other tested planters (however, likely doesn't affect tomato yields). High speed translates to a greater probability of long skips, though with an experienced crew these are less likely. Compared with other planters, not as adaptable to conditions of poor bed prep or non-level ground. Cannot change row configurations. Highest purchase price; large units also need powerful pump, tractor.
Opportunities: Labor costs are likely to rise and availability to fall, labor savings therefore likely to increase rather than otherwise. As more growers acquire automated machines, nurseries are more likely to invest in providing plants that work well with them.	**Threats:** Successful use depends on availability of appropriate plants/trays, good company support, and skilled, experienced operators. If these become less available, the planting speed will be slower and may do a poorer planting job.

Futura:

Strengths: Combines low labor requirement with medium speed, lower cost than other automated planters available. Adaptable to many different crops. Lower number of skips and more even spacing than Agriplanter; if a roller is used, may be more adaptable to poor bed prep or less level conditions. Existing customers get updates as they become available. Does not require a pump. Narrower shoe may give better plug-soil contact and reduces early heat damage risk—not tested by this study, but did see some evidence in 2023 with the FMAX, which uses the same shoe.	**Weaknesses:** Has difficulty with leggy plants. Not as fast as the Agriplanter, potentially translating to higher per-acre labor costs. A special shoe is needed, which may increase routine maintenance costs. In processing tomato, data suggests even spacing and low skip rate don't necessarily result in a yield advantage
Opportunities: Labor costs likely to rise and availability to fall, labor savings therefore likely to increase rather than otherwise. As more growers acquire automated machines, nurseries are more likely to invest in providing plants that work well with them. If climate change increases risks of planting into hot weather, it's possible the narrower shoe and more targeted water delivery system could give an agronomic advantage. However, this needs to be tested.	**Threats:** Successful use depends on availability of appropriate plants, good company support, and skilled, experienced operators. If for some reason these are not available it is less likely to succeed.

FMAX

Strengths:
Fewest skips of all planters tested. In the 2023 pilot trial FMAX rows had less heat damage than the other tested planters (finger and AgriPlanter), possibly due to narrow shoe which is designed to increase plug-soil contact and plug contact with transplant water. Adaptable to many crops, bed configurations, planting conditions. Can change plant spacing more quickly than the finger planter. Accommodates cracked trays. More output per person than finger planter, less training necessary, may need less water.

Weaknesses:
Slowest of the tested planters. Higher labor requirement than automated planters, requires contract labor. Does not perform well on hard clay soils. Less adaptable than the finger planter, requires better ground prep. Special shoes wear faster and increase maintenance costs.

Opportunities:
If incidence of hot weather during planting increases, it's possible the narrower shoe and more targeted water delivery system could give an agronomic advantage. However, this needs to be tested

Threats:
Increasing cost and decreasing availability of contract labor. Also, if more customers move to automated planters, which can't deal with non-uniform or leggy plants or cracked trays, it's possible nurseries will start assigning poorer quality plants to customers using non-automated planters

Finger

Strengths:
Most adaptable of all the planter types (e.g. if in-field adjustments are needed for planting depth). Least sensitive to hard or rocky soils, or poor bed prep or plant quality. Wide, robust shoe, wears less quickly than that of the FMAX. Used for many crop types, bed configurations, planting conditions. The machine is the least expensive to purchase.

Weaknesses:
Highest labor requirement of the tested planters; contract labor necessary. Labor has to be trained and skilled. Many people at planting leads to a lot of cars, traffic, and confusion, can also be a safety risk to the workers. Wide shoe may lead to poorer plug soil contact and pooling of transplant water at the bottom of the transplant furrow; meaning more water may be required. Relatively high maintenance cost, as cited in case study.

Opportunities:
As processing tomato production expands to areas where it's less typical (e.g. into Northern California, Washington), adaptability to non-ideal plant and soil conditions and utility for many vegetable transplants may be an advantage

Threats:
Increasing cost and decreasing availability of contract labor. Also, if more customers move to automated planters, which can't deal with non-uniform or leggy plants or cracked trays, it's possible nurseries will start assigning poorer quality plants to customers using non-automated planters

IV. Discussion:

Costs and savings

Our cost example for the AgriPlanter is likely conservative, as the data comes from a business which mostly uses it in custom planting. This business normally runs AgriPlanter with a somewhat larger crew and more slowly than is typical (based on conversations with other AgriPlanter growers). On average for this business, the 3-row AgriPlanter saves around $106 per acre in operational costs compared with the 3-row finger planter. Over 1500 acres per year, at this rate the AgriPlanter would pay itself off in about 2.2 yr. (For comparison, another local grower who uses it calculated a savings of $230/acre in labor compared to his 2022 labor costs with the finger planter). Another local grower, who replaced two 5-row finger planters with a single 5-row AgriPlanter, reports spending $22,000 in parts and labor on planting in 2024. Compared with the calculated labor cost alone with the finger planters, this represents a savings of $237/acre. Assuming the same wages and crew size as that reported for the 3-row AgriPlanter, the savings of a Futura over a 3-row finger planter are calculated to be around $102/acre, which over 1500 acres would pay itself off in around 1.3 yr. This also may be conservative, as it is also based on data from a custom planting operation which uses larger crews for a custom planting job than is recommended for someone planting on their own farm.

Lifespan & resale value

There is insufficient data yet on the lifespan and resale value of the automated planters. The oldest Agriplanters in use in California were purchased in 2021. The AgriPlanter US distributor, Puehler Ag, reports that they are aware of a machine in Italy which has been running for 22 years. They estimate that an Agriplanter could be sold for about 25% of the original cost after 20 years of use with reasonable maintenance. Shoes, belts, and bearings all need regular replacement, and the hydraulic pump also will need replacement at some point. The US distributor for the Futura, MTD Transplanting, said it was difficult to give an estimate for the lifespan since the machines are rebuildable and repairable. They estimate that a major overhaul may be needed every 10 to 12 years on a planter doing 1000 acres per year, and that a used Futura would probably sell for about 60-70% of its original purchase price.

Other concerns: plant quality, training needs, machine weight, available configurations

For both automated planters, the distributors emphasize that success depends on good communication with the nursery. For both planters, tall and leggy plants and poor uniformity can lead to problems, and for the Agriplanter cracked and broken trays are also a major issue. These can lead to slower days and long skips. Both also noted that it's very important to have someone on the machine who is well-trained and motivated to learn. Both Puehler Ag for AgriPlanter and MTD Transplanting for Futura offer staff trainings as part of the purchase price, as well as continuing support over the phone.

Automated planters are large, heavy machines, and the potential for delayed field entry or soil compaction was one of the initial concerns for their use. Weights are reported in Table 3. However, the users I spoke with report that this has not been an issue for them so far, and that the weight seems well-distributed.

All planters were tested in the 3-row, single-line configuration, as all planters needed to be in the same configuration and this is the most common locally for the Agriplanter. However, for both Agriplanter and Futura other configurations (e.g. 5- or 6-row, double-line) can be requested

Want more information?

This study:
Dr. Patricia Lazicki
UCCE Farm Advisor
(palazicki@ucanr.edu)
(530) 219-5198

Ferrari Growtech
Todd Diederich
MTD Transplanting
(todd@mtdfarms.com)

AGRI>PLANTER
Eric Puehler
Puehler Ag
(eric@pagco.us)

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CDFA BROOMRAPE BOARD SOLICITING COMMENTS

The Broomrape Board was created within the California Department of Food and Agriculture when Assembly Bill 402, Aguiar-Curry was signed into law in October of 2023. The board has authority to conduct research; survey, detect, analyze, and treat the causes of broomrape; and recommend an annual assessment and budget. The 13-member board was formed with industry recommendations and had its first meeting in May 2024. Over the course of the next several months the board developed a strategic plan (2024 - California Broomrape Board Strategic Plan) to guide its activities, recommended a $0.14 per ton annual assessment rate on processing tomatoes, and developed a set of voluntary compliance agreements for growers, processors, and transporters in infested and uninfested areas in order to detect broomrape infestations and prevent the spread to new areas.

The board is currently soliciting comments on the proposed compliance agreements from processing tomato growers, transporters, and processors. Comments can be sent to Broomrape_Program@cdfa.ca.gov until March 10, 2024.

Farm & Ranch Succession Planning Workshop

WHEN: February 13, 2025, 8:00am-1:30pm
WHERE: Hotel Winters (12 Abbey St. Winters)
DETAILS: $25 registration fee, lunch included.
Advance registration required

California Rangeland Trust and Yolo Land Trust are partnering to host a workshop for farmers and ranchers of Yolo County interested in succession planning for the transfer of their land to the next generation of ownership. This engaging discussion will include an opportunity to hear from experts on estate planning, business transition, appraisals, and conservation strategies.

Farmers and ranchers of all experience levels and backgrounds are invited to join the workshop.

Register here

Zero Foodprint Restore Grant—open till 2/19

The Restore program serves as a catalyst for federal, state, and regional efforts to increase the beneficial ecosystem services provided by agriculture and specifically to advance climate change goals by improving soil health and sequestering atmospheric carbon.

The grant provides funding up to $25,000 to implement farm practices such as cover cropping, hedgerow establishment, and compost applicationother regenerative practices.

Who is eligible?: Farmers and rachers in CA, CO, OR, and WA. Full eligibility criteria is available in the grant guidelines: https://files.constantcontact.com/76b51227701/fcb13e4c-21a6-4ace-8fcc-ae9fff46c249.pdf

Deadline to apply: 2/19/2025

Farmers in Yolo, Solano, and Sacramento Counties can reach out to Phillip Fujiyoshi (pfujiyoshi@ucanr.edu) for application assistance.

When: March 4, 2025, 8 am-12 pm + lunch
Where: Woodland Community College 2300 E. Gibson Rd, Woodland (Community Room)

Free, but pre-register for lunch (here)

Questions? Phillip Fujiyoshi pfujiyoshi@ucanr.edu; Margaret Lloyd mglloyd@ucanr.edu, 530-564-8642

UC Ag Experts Talk: Considerations for Cover Crops and Weed Management

Date & Time

Mar 19, 2025 03:00 PM in

In this webinar, Sarah E. Light, Agronomy Farm Advisor with University of California Cooperative Extension, Sutter-Yuba County, will give an overview of both summer and winter cover crop management for optimized weed control. She will include potential herbicide savings from reduced application, risks when termination goes wrong, and weed management considerations when implementing cover crops. Sarah will share results from multiple sites and years in the Sacramento Valley and will discuss the impact of cover crop variety, and weather, on weed pressure.

One DPR CE unit (other) and one CCA CE unit (IPM) were requested.

Register here

New Woodland UCCE Office Location

The UC Cooperative Extension office in Woodland has moved from our long-time location on Cottonwood St. Our new (temporary) location is near the corner of Rd 102 and Gibson, near the Community College. Our address is:

2780 East Gibson Road
Woodland, CA 95776