Field Notes
San Joaquin County
November 2016
University of California
Agriculture and Natural Resources | Cooperative Extension

Livestock and Natural Resources Updates

Antibiotics Use as of January 2017
As of January 1, 2017, the U.S. Food and Drug Administration will be implementing a voluntary approach limiting the use of "medically important antimicrobials" in livestock production. The FDA goal is to have pharmaceutical companies voluntarily change the labeling on antimicrobials and antibiotics such as penicillin, tetracycline, and erythromycin, from Over The Counter (OTC) to Veterinary Feed Directive (VFD). What this means is that once the labeling has been changed, to obtain any of the drugs for prevention or treatment for your livestock, you will have to have a veterinarian prescribe the drug for you. The FDA guidelines also require that you keep records for two years.

California has its own antibiotic legislation that has been passed and signed by Governor Brown. Senate Bill 27 has a timeline of January 2018 for implementation. It will follow the FDA guidelines but will have more teeth for the California Department of Food and Agriculture to enforce the legislation. There will be more oversight, inspections and fines if people are found in violation of the law ($250 per day for the first offense, and $500 per day for each subsequent violation). For the most part, small number livestock owners will be affected disproportionately by these legislative regulations since they typically do not have an established vet-client relationship.

You will still be able to have access to drugs that you need to treat your animals, but instead of being able to purchase them over the counter, you will now have to have a relationship with a veterinarian and have the vet write a prescription for you. Be sure you are prepared for the changes.

University of California Cooperative Extension Wild Pig Survey
In managed rangelands and agricultural areas, feral or wild pigs are a significant pest species. However, estimates of total damaged area occurring on these lands are ill-defined and subject to a high degree of variability. Wild pigs can be important vectors of disease, can cause forage and crop loss, and set up sites for erosion, effecting water quality and allowing invasive plant species to establish. They can also prey on livestock. The geographic extent of wild pig damage in California is currently unknown, making it difficult to mitigate and manage losses and estimate the economic impact on private landowners and public lands.

UCCE Livestock and Range Advisors and Wildlife Specialists need your help in filling out a short statewide survey on wild pig damage, found at: http://ucanr.edu/survey/survey.cfm?surveynumber=16522. It should only take about 15 minutes to complete. Individual identities and survey responses will be kept confidential. Participation in the survey is entirely voluntary.

In conjunction with the survey we have developed a smart phone or tablet app that will help landowners and managers identify and record feral pig damage so that we can estimate the land area and economic impacts over a longer time period. If you are interested in participating in data collection using our mobile application, please fill out the survey and indicate your interest at the end.

If you have questions about the survey or would like a paper copy, please contact either UCCE Livestock & Natural Resources Advisor, John Harper, at 707-463-4495 or jmharper@ucanr.edu or UCCE Wildlife Specialist, Roger Baldwin, at (530) 752-4551 or rabaldwin@ucdavis.edu.

California Rangeland Conservation Coalition Annual Summit 2017
The Summit will be held at the San Joaquin County Robert J. Cabral Ag Center in Stockton on January 13, 2017 with a tour on January 12th. Registration will be open by December 1st. The theme will be Celebrating the Diversity of California Rangelands and Ranches, with a focus on rangeland restoration. For more information contact Theresa Becchetti, 209-525-6800.

Theresa Becchetti
Livestock and Natural Resources Advisor

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Silage Structure Options: Not One Size Fits All

Current California Silage Storage Practices
In 2013, a survey on Corn Silage Management Practices was mailed to dairies in the San Joaquin Valley. A total of 160 producers replied to the survey. Select responses are summarized below.

Type of Silage Structures
Silage is primarily stored in wedge (34%) and drive-over piles (32%) with far fewer structures consisting of bunkers (7%) or bags (6%). Twenty-one percent of dairies used a combination of structures to store silage, most often a bag with a previously mentioned structure type. In terms of future storage trends, roughly a third of surveyed producers expressed interest in moving towards drive-over piles, and the overwhelming consensus was that bunker silos are a thing of the past (84% would not use bunkers in the future).

Width and Depth of the Face Removed
The entire width of the face was removed daily in 54% of dairies, but only half of these dairies removed at least 12 inches of depth. Of those dairies removing half of the face daily (15%), less than half removed the recommended 12 inches of depth. These numbers indicate that current practice is not to size silage structures according to feed-out needs. Sizing of structures appears to be a function of physical space available to store silage. In the same survey, 56% of dairies expressed interest in increasing their silage storage area.

Thinking about changing silage structure type?
A few key questions should be evaluated, as each of these may impact silage quality and spoilage.

- How many animals are you currently feeding, and will this number be increasing or decreasing?
- Do you currently move across the entire silage face daily, with a depth of at least 12 inches?
- What does surface spoilage look like (top and sides)?
- What is your current maximum height, and can your front-end loader/defacer reach the top?

Changing structure type or physical layout will likely impact exposed surface area and modify the opportunity for spoilage. In a 2011 study, exposed silage face surface area was evaluated. In general, drive-over piles were larger than wedge piles, which were larger than bunkers. Bagged silage was not evaluated but would lend to the smallest surface area of the storage options. Carefully evaluate existing face stability and feed-out depths before modifying storage structure design. If you currently do not move across the face daily, or you notice that lack of depth removal is causing a decrease in feed quality, moving from a smaller working face to something larger likely will not improve your feeding situation.

Strengths and Weaknesses of Types of Silage Structures.
Each of the different structure types has strengths and weaknesses, and not all are discussed here. Drive-over piles have *potential* for decreased height and increased packing density on the sides, but as mentioned above, have large exposed faces that may be difficult to move across in a timely manner and require large amounts of plastic. Wedge piles are intermediate in exposed face, require less plastic than drive-overs, but safety concerns both while building and feeding from the pile should be considered. Bunkers make for the least flexible storage option with a fixed width and height, a likely reason bunker popularity has declined. Bags are easy to feed from and boast the smallest exposed surface area, but large amounts of plastic and a potentially large land footprint, combined with the need to carefully monitor the plastic for damage (low packing density allows air to readily infiltrate the silage mass when rips/holes occur) should be considered.

Take-Home Thoughts
What works for your neighbor, might not be the best fit for your feeding needs. There is no one structure that works best for every operation. Any discussion to change silage structures (and thus, feed-out activity) should be discussed with your nutritionist and other members of your silage team.

Authors want to extend a special thanks to all participant dairies that took the time to complete the survey.

Reference: Heguy, J.M., D. Meyer, and N. Silva-del-Rio. 2015. A survey of silage management practices on California dairies. Journal of Dairy Science. doi: http://dx.doi.org/10.3168/jds.2015-10058.

Jennifer Heguy, Dairy Advisor
Deanne Meyer, Livestock Waste Management Specialist and
Noelia Silva-del-Rio, Dairy Production Medicine Specialist

Alfalfa IPM Survey

How much IPM is being used in alfalfa in California? A new survey tool wants to help answer that question and we need your help.

If you are interested in developing measures of progress in alfalfa IPM, please volunteer to take the on-line survey (http://survey.ncsu.edu/IPM/CAalfalfa). This survey will be used to gauge the level of IPM utilized by California alfalfa growers and support your Extension and research professionals in getting a better picture of alfalfa pest management practices

The survey will take about 20 minutes to complete. All answers are completely confidential and will be grouped for analysis purposes. Survey results will be compiled by the Center for Urban Affairs and Community Services at NC State University. If you have questions about the survey, please contact Dr. Jean-Jacques Dubois, at jbdubois@ncsu.edu.

Thank you for your participation.

Announcements / Calendar of Events

Alfalfa and Forage Symposium
November 29 to December 1, 2016
Peppermill Resort Casino, Reno, Nevada
For more information and to register, visit http://calhay.org/symposium/.

California Cherry Research Review
Thursday, January 5, 2017
Cabral Agricultural Center, 2101 E. Earhart Ave., Stockton, CA
Details TBA

SJC and Delta Field Crops Meeting
Friday, January 6, 2017
8:00am to 12:00pm
Cabral Agricultural Center, 2101 E. Earhart Ave., Stockton, CA
Contact: Michelle Leinfelder-Miles mmleinfelder-miles@ucanr.edu

California Rangeland Conservation Coalition Summit
January 13, 2017 with field tour on January 12th
Cabral Agricultural Center, 2101 E. Earhart Ave., Stockton
9:00am – 4:00pm
Contact: Theresa Becchetti tabecchetti@ucanr.edu

UCCE Northern San Joaquin Valley Processing Tomato Meeting in conjunction with the CTGA Annual Meeting
Wednesday, January 25, 2017
8:00am to 11:00am
Modesto Double Tree Hotel, 1150 9th St, Modesto, CA, 95354
Info on UCCE educational meeting: Brenna Aegerter bjaegerter@ucanr.edu
Info on CTGA Annual Meeting and Exhibition: http://www.ctga.org

Grape Day
February 1, 2017
Hutchins Street Square, 125 S. Hutchins Street, Lodi
8:00am – 12:00pm, Doors open at 7:00am.
Morning session is free. Lunch is $25. Lunch speaker TBA.
Contact: Paul Verdegaal psverdegaal@ucanr.edu

Quad-County Walnut Institute
Thursday, March 2, 2017
Stanislaus County Agricultural Center, 3800 Cornucopia Way, Modesto, CA
Details TBA

Processing Tomatoes: Evaluation of Fusarium-resistant and –tolerant varieties

This year, five UC farm advisors conducted uniform trials of processing tomato varieties with resistance in the Woodland area (Gene Miyao), the Stockton area (myself), the Dos Palos area (Scott Stoddard), and the Huron area (Tom Turini). At four of the five locations, we observed Fusarium wilt pressure in the trial.

Our local trial was located west of Stockton in a drip-irrigated field on Jones Tract. The bed configuration was a single plant row per bed with 60" between bed centers. The trial was transplanted on April 28th, and harvested on September 3rd (128 days). Varieties were replicated four times within the trial; plots were 100 feet long and were machine harvested. A roughly 25-lb sample from each plot was hand sorted to obtain data on the percentage of fruit categorized as green, blackmold, sunburn, etc. In addition to the new F3-resistant varieties, we also included two varieties recognized as F3-tolerant, and a susceptible variety. At about one month prior to harvest, the incidence of Fusarium wilt had reached 29% in the susceptible variety H 8504. With respect to fruit yield, the top-performing group of varieties included N 6428, BP 2, HM 3887 (tolerant, but not resistant), SVS 8232, H 1310, N 6429, and HM 58801. For Brix yield, top varieties were HM 3887, SVS 8232 and HM 58801. Most varieties performed better than the susceptible variety H 8504. These results (see Table 1, page 4) back up our recommendation that resistant and/or tolerant varieties are the most effective way to manage Fusarium wilt. Other control measures, such as drip fumigation with Vapam or K-Pam appear to have limited effectiveness based on local observations. We could not have conducted this trial without the generous cooperation and support of our grower cooperator Rick Marchucci, the processor Morning Star, the seed dealers Ag Seeds and T.S. & L., and the California Tomato Research Institute. The combined report on all five trials will be available later in the winter.

Brenna Aegerter, Vegetable Crops Advisor

Table 1. Yield, fruit quality, disease incidence and overall vine health of processing tomato varieties in a field with Fusarium wilt Race 3, Jones Tract, Stockton, 2016.

Variety	Disease resistances[w]	Total yield[x] (t/ac)		Soluble solids (° Brix)	pH	Color	Pink %	Green %	Sunburn %	Mold %	BER %	Fusarium wilt %[y]	Vine health[z] Necrosis %	NDVI
N 6428	VFFFNSW	44.7	a	4.75	4.42	23.8	8	2	10	1	1.6	0.0	51	0.41
BP 2	VFFFNSW	44.5	a	4.80	4.49	23.8	5	10	5	1	0.3	0.0	29	0.48
HM 3887	VFFNSW (F3-tol)	43.9	a	5.15	4.37	24.8	10	4	10	4	0.6	17.4	24	0.45
SVS 8232	VFFFNSW	43.2	ab	5.08	4.38	22.0	3	4	11	5	1.5	0.0	65	0.40
H 1310	VFFFNSW	41.2	abc	4.83	4.40	22.8	5	2	13	2	8.4	0.3	65	0.38
N 6429	VFFFNSWLV	41.1	abc	4.85	4.44	23.5	1	1	8	2	1.0	0.6	68	0.39
HM 58801	VFFFNSW	41.0	abc	5.25	4.41	23.8	3	7	5	2	0.6	0.0	13	0.56
BQ 141	VFFFNSW	39.7	bcd	4.78	4.40	22.0	3	2	10	3	0.5	0.0	68	0.37
H 1539	VFFFNSW	39.0	cd	4.80	4.40	20.8	2	1	7	2	0.4	0.3	60	0.40
BP 16	VFFFNSW	38.9	cd	5.00	4.42	23.3	5	6	7	2	0.3	0.0	41	0.42
DRI 319	VFFNSW (F3-tol)	38.7	cd	5.13	4.40	23.3	2	2	10	3	0.9	21.7	76	0.37
SVS 2493	VFFFNSW	37.4	cde	4.80	4.44	23.0	1	1	9	7	0.2	0.0	78	0.33
BQ 406	VFFFNSW	36.7	de	5.18	4.42	22.5	2	4	8	3	2.2	1.0	48	0.45
H 8504	VFFN (F3-susc)	34.6	e	4.55	4.37	23.5	2	1	22	4	1.1	28.6	84	0.27
BQ 142	VFFFNSW	34.1	e	4.73	4.43	23.3	3	4	9	5	2.3	0.3	59	0.41
	Average	39.9		4.91	4.41	23.1	3.8	3.4	9.6	3.1	1.5	4.68	55.1	0.404
	LSD@5%	4.1		0.33	---	1.7	4.4	2.6	---	3.2	2.7	4.8	20.4	0.06
	P value	<0.0001		0.0028	*NS*	0.013	0.013	<0.0001	*NS*	0.036	<0.0001	<0.0001	<0.0001	<0.0001
	%CV	7.16		4.8	1.2	5.3	81.2	54.0	65.1	72.3	129.8	72.4	26.0	10.6

Values represent the mean of four observations; means in the same column followed by the same letter are not significantly different according to Fisher's Least Significant Difference Test.

w Key to disease resistances: V = Verticillium wilt race 1, FF = Fusarium wilt race 2, FFF = Fusarium wilt race 3, N = Root-knot nematode, SW = tomato spotted wilt virus, LV = powdery mildew caused by *Leveillula taurica*.

x Total yield is from weigh trailer weights from machine harvest with limited sorting

y Percentage of plants exhibiting symptoms of Fusarium wilt by August 5th

z Vine necrosis and NDVI ("greenness") measured on August 22nd. Note that these ratings may vary due to factors other than Fusarium wilt.

Grape Digest

The 2016 harvest came to a close with an intense effort to bring in the last of the grapes after a heavy rain on October 14th. The majority of fruit was harvested just before the heavy downpour that brought about 3 inches of rain across the area. By the last week in October, most of what remained had been harvested as another storm arrived. There were a few acres of uncommitted blocks that struggled to get delivered, but overall the harvest was good.

This year, budbreak was about 10 to 12 days ahead of average, on March 5th. Temperatures were warm, but not hot, with little to no morning dew. Drought conditions were alleviated by slightly above average rainfall, 17.8 inches total. The pattern was unusual with heavy rains in December and January, a dry February, and more rain in March. This encouraged very strong canopy growth and seemed to provide ideal conditions for gophers, making 2016 the "Year of the Gopher" from my observations.

The drought has taken a toll on older vines. There was scattered vine collapse and dieback, especially in vines 20 years old or older. These areas of rapid decline are being investigated but may be too complicated to sort out. Last year's above average rains and a good start to this year may help alleviate some of these mysterious problems (I hope).

Powdery mildew problems were scattered, but there were a few major disasters. Mite problems flared somewhat in the last part of the summer but still occurred rather scattered and inconsistently considering the dry soil conditions. The season ended with a total of 12 days with a maximum temperature at or above 100°F. The Growing Degree Day (GDD) accumulation ended up on October 31st with about 3550 GDD accumulated.

Harvest began very early but a few days later than the extremely early harvest of 2015. Some light crop Chardonnay was picked on August 8th, but harvest got fully under way around August 11th, with Pinot grigio, some Sauvignon blanc, Muscat selections and Pinot noir for sparkling wine. Temperatures moderated the last part of the season as harvest began. This slowed ripening; there was mixed variety development, with mid-season and late season varieties maturing at the same time. Fortunately, the harvest pace did seem to allow for orderly harvest. The first Zinfandel berries with color began to show around July 4th (about average). Zins harvested for red were ready September 10th (about average).

Overall, yield ranged from about 15% below long term performance to 10% above average, depending on variety. Exceptions on the heavier side of average occurred in young vines and in varieties such as Zinfandel, Merlot, and Cabernet Sauvignon; while exceptions on the lighter side was for early varieties and less vigorous vines, depending on vine age, variety, site, and grower/winemaker goals. Quality was good, and fortunately, Sour (Summer Bunch) rot was almost nonexistent, as in 2015.

Grape Red Blotch associated Virus (GRBaV) is still occurring and may be spreading but remains somewhat mysterious. It doesn't seem to be as quick or dramatic in severity, as some of the traditional Leaf Roll or Fanleaf viruses, but in some varieties and some sites, it does seem to inhibit sugar accumulation. The frustrating part of GRBaV is that we don't know if there are pest vectors, where it came from, how long it has been around, or if there are different strains. See http://ucanr.edu/sites/NCPNGrapes/files/161782.pdf for more information.

Vine Mealy bug is still spreading through the county, so be aware of any new infestations, often indicated by sooty (black) mold and honeydew staining on the bark of the trunk or cordons, or excessive honeydew and waxy secretions in clusters, on spurs or along cordons. A high degree of ant activity in and around vines can also indicate problem spots. Good places to focus a first look are where birds tend to perch or roost. It does appear the materials available for control are working but have taken longer to fully suppress active populations. Early control, and rotation or combination of materials are important.

For growers, costs and regulations continue to increase, making operations more difficult, but Lodi and San Joaquin County are in a good position to continue the tradition of quality wines of value.

Fall Checklist

-Post-harvest irrigation to help maintain soil moisture is okay until rains are steady.

-Little to no nitrogen should be applied now, but potassium now (or early next year) is okay. It won't "move" like nitrogen. To get the full benefit of compost, it needs to be disked in.

-Make a note of any problem weed species that may be increasing.

-Mark any vines with excessive red leaves and/or leaf roll for monitoring of fruit quality next year or for possible removal before then.

-Renew your Irrigated Lands Regulatory Program permit/membership.

-Update your air pollution mitigation plan if you have 100 acres or more in a single vineyard.

-Review your pesticide use reports and get everything up to date.

-Check for locations near riparian areas, trees and other bird roosting sites for VMB. Focus on these areas next spring in any VMB control program. Lorsban (chlorpyrifos) is still an option for a late winter application, but be careful of sprays before any late winter/early spring storms, especially near natural drains and waterways.

-Gophers, voles and squirrel activity are still common and may deserve attention with baits, gas cartridges, fumi-

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gant pellets (usually better in spring), trapping, shooting, or a combination of several of the methods. Remember ground squirrels are fair game, tree squirrels require a depredation permit. Owl boxes can help stabilize rodent populations but do not control them.

Paul Verdegaal, Viticulture Advisor

Field Corn Variety Trial Results

Table 1 shows the results of the 2016 UCCE Delta field corn variety trial, located on Tyler Island (see page 7). Three replicate blocks of 18 varieties were planted on April 27th by air planter. The 18 varieties included 16 varieties submitted by seed companies and two varieties submitted by the grower. All varieties supplied by the seed companies were glyphosate-tolerant varieties. Each plot consisted of four 30-inch beds on an average row length of 1158 feet. Seed was planted approximately two inches deep and six inches apart down the row. The soil is a Rindge mucky silt loam with approximately 20 percent organic matter in the top 15 inches of soil. The Rindge series is a mucky peat soil down to about 60 inches, and approximately 55,600 acres in the Delta are described by the Rindge classification. The previous crop in the field was wheat. Subsurface irrigation by "spud ditch" was employed three times. Nitrogen was applied preplant (125 units/acre as NH_3), and 34 gallons/acre of 8-24-6 with ½% of zinc was knifed in at planting. Weed control was by cultivation and herbicide application (Steadfast, Shark, and No Foam A adjuvant). Zeal miticide was applied. The field was harvested on October 10th.

The table presents mean values for the three replicates. When interpreting the results, keep the following in mind. The mean is equal to the sum of values divided by the number of values, in this case, three replicates. The statistical method used to compare the means, called Tukey's range test, compares all means against each other. Varieties were considered statistically different if their P value was less than 0.05, or 5 percent. What this means is that when differences between varieties exist, we are 95% certain that the two varieties are actually different; the results are not due to random chance. Differences between varieties are indicated by different letters following the mean. For example, a variety that has only the letter "a" after the mean yield value is different from a variety that is followed by only the letter "b", but it is ***not*** different from a variety whose mean value is followed by both letters ("ab"). Similarly, a variety whose mean yield is followed by the letters "ab" is not different from a variety whose mean yield is followed by the letters "bc". Seven varieties have a letter "a" following their mean yield, which means that those seven varieties all performed similarly in the trial. The numerical values of these seven varieties differ, but based on this research, we cannot attribute those numerical differences to variety differences. Among varieties, there were also differences in stand count, bloom date, fusarium ear rot presence, ear height, grain moisture, and bushel weight.

The CV, or coefficient of variation, is the standard deviation divided by the mean, or a measure of variability in relation to the mean. For some measures, particularly the disease percentage, the variability between the three replicates was very high.

Special thanks go to grower cooperators, Steve and Gary Mello, and participating seed companies.

Michelle Leinfelder-Miles, Delta Farm Advisor

Whole Almond Orchard Recycling

Biomass co-generation plants have closed throughout California and the ones still open have limited the amount of wood chips they are accepting and reduced the amount they will pay for wood debris. Removed orchards used to be pushed and burned before air quality restrictions were implemented. More recently orchards were ground up with a tub grinder or wood chipper and the woody debris was hauled out of the orchard and burned in a co-generation plant for electricity. A small percentage of the wood waste was sold as mulch or compost off site. Tree fruit growers wishing to remove old trees and orchards that can no longer be taken to a co-generation plant need to find an alternative method of disposing of their removed trees and orchards.

Whole orchard recycling, or the grinding and soil incorporation of whole trees during orchard removal, could provide a sustainable method of tree removal that could enhance both air and soil quality. When orchards are removed, the stored carbon in the wood is lost from the orchard system, but if whole orchard recycling is implemented, we hypothesized that the amended soil would sequester carbon at a higher rate, have higher levels of soil organic matter, increased soil fertility, increased water retention, and help reduce greenhouse gas emissions.

Some considerations for whole orchard recycling include tying up valuable nutrients from second generation trees because of the high carbon to nitrogen ratio that could result from the incorporation of woody debris before replanting. Another is that the woody debris might be so large that it would interfere with normal soil preparation and orchard floor management practices. The effect of woody soil amendments on replant disease and pathogens has not been completely investigated; however, there are several reports in the literature where increased soil organic matter has increased microbial diversity and reduced soilborne diseases. If wood grindings do not tie up valuable nutrients in the soil, worsen replant disease, or interfere with harvest, then growers would be more likely to adopt grinding and incorporating as an alternative to burning or removing debris from their orchards, especially if advantages to soil health, tree nutrition, and ultimately yield can be demonstrated.

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Table 1. 2016 UCCE Delta field corn variety trial
By: Michelle Leinfelder-Miles, UCCE farm advisor

Initials	Entry Name	Company Name	Stand (Plants/A)	Days to Bloom[1]	Fusarium ear rot (%)[1]	Head Smut (%)[1]	Common Smut (%)[1]	Plants Lodged (%)	Ear Height (in)	Moisture at Harvest (%)[1]	Bushel Weight (lbs/bu)	Yield[3] (lbs/A)[1]
DKC	62-08RIB	DeKalb	34558 ab	71 abc	3 bcd	1	0	0	58 abcd	14.6 def	60.9 bc	17032 a
ES	7514VT2P	Eureka Seeds	35719 a	70 abcd	3 bcd	0	0	0	50 de	14.9 cde	61.8 abc	16429 ab
ES	7667VT2P	Eureka Seeds	32815 abc	69 bcde	4 abcd	0	0.7	0	50 de	14.9 cde	62.7 a	16331 abc
DKC	63-07	DeKalb/Grower	33832 abc	68 de	4 ab	0	0.3	0	47 e	14.8 cde	61.5 abc	15938 abc
LG	5701VT2P	LG Seeds	34412 abc	71 abc	3 bcd	0.7	0.3	0	53 bcde	15.8 bc	61.6 abc	15861 abc
CP	7087VT2P/RIB	Croplan	32089 bc	68 de	10 a	1	0	0	54 abcde	14.8 cde	61.9 abc	15823 abcd
G	6708VT2P	Golden Acres	34848 ab	70 abcd	3 bcd	0.7	0	0	52 cde	15.8 bc	61.4 abc	15576 abcde
G	7601VT2P	Golden Acres	33686 abc	69 cde	3 bcd	1	0.7	0	62 ab	15.4 bcd	60.5 cd	15512 bcdef
BAG	SX 5543 RR	Baglietto Seeds	34267 abc	68 de	8 ab	1	0	0	46 e	14.9 cde	62.2 ab	15361 bcdef
DKC	63-71RIB[2]	DeKalb	33977 abc	68 de	8 abcd	0.3	0.3	0	51 de	14.2 ef	61.9 abc	14895 bcdef
INT	6474DGVT2PRORIB	Integra	34267 abc	71 abc	3 abcd	0	0	0	63 a	14.2 ef	61.0 bc	14852 cdef
PI	31N27	Pioneer/Grower	31363 c	72 ab	4 abcd	1.3	0.3	0	60 abc	16.1 b	62.6 a	14229 defg
LG	5622VT2P	LG Seeds	34848 ab	68 de	2 cd	0.7	0	0	52 cde	13.5 fg	62.6 a	14176 efg
INT	6612GSS	Integra	34122 abc	68 de	4 abcd	0	0	0	54 abcde	13.9 ef	59.3 de	14088 efg
MY	2D848	Mycogen	34122 abc	72 ab	0 d	0.3	0	0	56 abcd	18.8 a	59.0 e	13902 fg
TGY	8156GT	TechAg Seeds	32815 abc	72 a	2 bcd	2.3	0	0	54 abcde	16.1 b	59.4 de	12753 gh
CP	6525VT3P/RIB	Croplan	35284 a	68 de	6 abc	1.3	0	0	51 de	12.3 gh	60.6 cd	12723 gh
MY	2A499SXRA	Mycogen	33396 abc	67 e	1 cd	1.3	0.3	1.7	52 cde	11.6 h	61.7 abc	10644 h
Average			**33912**	**70**	**3.9**	**0.7**	**0.2**	**0.1**	**54**	**14.8**	**61.3**	**14792**
Coefficient of Variation (%)			**4**	**3**	**76**	**128**	**225**	**756**	**10**	**11**	**1.9**	**11**
Significant variety effect (P value)			**0.0012**	**<0.0001**	**<0.0001**	**0.1614**	**0.1370**	**N/A**	**<0.0001**	**<0.0001**	**<0.0001**	**<0.0001**

[1] Data were transformed for analysis. Arithmetic means are presented.

[2] Average of only two replications.

[3] Yield adjusted to 15% moisture.

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I have been involved in a project at the UC Kearney Research and Extension Center, in cooperation with farm advisor David Doll and USDA Plant Pathologist Dr. Greg Browne, to compare the grinding up of whole trees with burning. In 2008, an experimental stone fruit orchard on Nemaguard rootstock was used to compare whole tree grinding and incorporation into the soil with the 'Iron Wolf,' a 50-ton rototiller, versus tree pushing, burning, and ash spreading. Second generation almond trees were planted in February 2009. We compared second-generation orchard tree growth, replant disease, the nitrogen to carbon soil ratio, soil organic matter, soil-plant nutrition, and the soil water holding capacity between treatments.

The whole tree grinding of stone fruit trees, estimated at 30 tons per acre, did not stunt replanted almond tree growth after eight growing seasons. Leaf petiole analysis revealed higher nutrients (nitrogen, potassium, phosphorus, manganese, and iron) and less sodium and magnesium levels in trees growing in the "grind" treatment, compared to trees in the "burn" treatment. Increased organic matter appears to either reduce available sodium for tree uptake or improve soil leaching. Replant disease was not observed in this trial.

Leaf stem water potentials taken during the 2015 and 2016 seasons indicated that trees in the grind plots were less stressed by temporary water deficits. Furthermore, bud failure severity was lower on 'Carmel' trees in the grind treatment compared to the burn treatment.

Yields were taken for six seasons, and even though a significant difference between treatments on any given year was not observed, the six year cumulative total has the grind treatment out producing the burn treatment by 1,184.6 pounds per acre. This should provide growers with a financial incentive to recycle old orchards. After observing our results, several growers have adopted tub grinding, spreading, and incorporating as an alternative to sending orchard debris to co-generation plants. We estimate that approximately 1,500 acres of orchards were ground and incorporated in 2015 and nearly 15,000 acres in 2016. Grinding, spreading, and incorporating wood chips back into the orchard brings the expense of whole orchard recycling close to $1000 per acre.

Several new trials were established in 2016 to examine two methods of whole orchard recycling with a control. One trial compares a Morbark horizontal chipper (Figure 1), where the chips have to be spread back on the orchard floor (Figure 2), with whole tree orchard grinding with the Iron Wolf, a 100,000 pound rock crusher that grinds trees and roots in place, compared to the standard practice of orchard debris removal for energy co-generation.

The Iron Wolf ground up and incorporated about two acres of trees per day, while the horizontal chipper could chip up to 15-20 acres per day. The cost of the Iron Wolf per acre was close to $1,500 and concentrates rather large chunks of wood in 10 foot strips down the tree row, while leaving the row middles relatively free of wood.

Growers may have difficulty with the large chunks of wood if they are laser leveling or land scrapping. With the tub grinder, the chips still have to be spread back onto the orchard floor and disked in, but they make a much smaller wood chip that can be spread evenly over the whole surface of the orchard floor, typically between 1-2 inches deep. Growers can easily disk or till these wood chips into the soil with their own equipment. In our trials we spread the wood chips back onto the orchard floor at the same rate they were removed, which ranged from 50-80 tons per acre depending on tree size and age.

Samples of the wood chips were analyzed for their nutrient content. The nitrogen content of the wood chips averaged 0.31 %, potassium 0.20 %, calcium 0.60 %, and carbon 50 %. When 64 tons of wood chips are returned to the soil per acre, 396 pounds of nitrogen, 768 pounds of calcium, 256 pounds of potassium, and 64,000 pounds of carbon per acre will be added. This material will not be available immediately to the next generation orchard but ultimately as the woody material decomposes and organic matter builds the nutrients will be released.

We hope that this project will provide scientific evidence to inform legislation that would allow growers to receive carbon credits for recycling their orchards, helping to compensate them for the extra expense incurred when keeping their wood chips on site and incorporating them into the soil. Please contact me if you are thinking about whole orchard recycling—we would like to try this process in walnut!

Brent Holtz, Farm Advisor and County Director

Figure 1. Morbark Horizontal Chipper

Figure 2. Kuhn & Knight Spreader

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☐ ***Field Notes*** - Quarterly publication (all commodities)

☐ ***Pomologist*** - (Tree fruits, Walnuts)

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November 2016