

Fall 1999

What's the best buy for soil amendments?

October and November are traditionally the months where San Joaquin Valley growers do the most ground prep and amendment work to improve soil quality. The objective, of course, is to build a productive soil for the long haul, not just next year's crop. The choice of materials, and sometimes the price, is staggering. It's time to look at your budget for the coming season and decide what's the best bang for your buck. This newsletter will help you look at the comparative cost and benefits of gypsum, sulfur, manure, composts and some water-run materials. Comments are provided to help sort out some of the differences between the different mineral (gyp, sulfur, etc.) and organic (manure, composts) amendments. If you don't see the product you're thinking about using and you have questions, call me. ***Better yet, sign up for the meeting advertised at the end of this letter!***

In a book called "Defining Soil Quality for a Sustainable Environment", the Soil Science Society of America came up with a definition that any farmer can get his hands around:

"Soil quality is the capacity of soil to function effectively at present and in the future."

For the Westside cotton farmer, that may mean a maintenance application of soil sulfur provides the long-term 'quality' he is after. For the potato grower in Arvin, he may need some acid, compost, and gypsum to get to the levels of pH, tilth and infiltration that make for good potato ground. ■

Inorganic amendments—what do the different materials do?

The focus is on amendments that can provide free calcium ions to the soil matrix and for changing soil alkalinity or acidity. FREE calcium ions are the key here for displacing sodium on clay surfaces and increasing 'aggregation' of soil particles. This improves structure, 'tilth' and infiltration for reclaiming saline-sodic soils. This is a straight-forward chemical reaction, and the amount of calcium released can be calculated. Unfortunately, the exact benefit (say increased infiltration) of that amount of calcium for a given field cannot be as accurately predicted.

Gypsum has been applied in Kern county for over 50 years when the first pits were dug on the Westside Carizza Plains. Other, more refined sources of this material are now available. When applied to the soil or mixed in the irrigation water at low concentrations this salt will always release a free calcium ion regardless of pH. (High levels of bicarbonate in the water, however, will precipitate lime as the soil dries.) The '**Gypsum Requirement**' (GR) reported by many labs is usually the amount of 100% gypsum ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$) required to remove enough sodium from the soil to get the 'exchangeable sodium percentage' (ESP) down to 10%. This is an old benchmark and not always the best point. Some Westside soils containing precipitated gypsum as well as lime don't need to go this low. For some Eastside or south Kern soils irrigated with low-salt canal water,

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surface sealing and crusting are still a problem with an ESP of 5%. (For much of this ground the best strategy is to water run solution grade gypsum.) Broadcast applications of pit gypsum usually lose their effectiveness by mid-season, but can be cost effective for jump-starting some of this 'hard-setting' ground that has been previously ignored.

For some cotton and sugarbeet ground an ESP of 10-15% may not be all that bad if the soil salinity has an 'electrical conductivity' (EC) > 3 mmho/cm and the EC of the irrigation water is > 6. As a rough rule of thumb you want the ESP of the soil, or the 'sodium adsorption ratio' (SAR) of the irrigation water < 5 times the EC. (Come to the Ag Salinity Management Seminar, November 4, to learn how to calculate your own GR.) Most of our quality southern San Joaquin Valley labs or local soils consultants will fine tune this number if you ask.

Once you have a GR you're satisfied with you need to determine the most effective mechanism to get that free calcium into your soil profile. If you need to modify your pH then you will need to use sulfur or acid to lower it or lime if you want to raise the pH.

Sulfur only works to release calcium ions if free lime is present in the soil. The rate at which this happens depends on temperature, soil texture, moisture, the particle size of the sulfur and little beasties called thiobacillus—sulfur loving bacteria. These bacteria generate acid from the sulfur which then attacks the lime. Free calcium is released and then adsorbed on clay particles, displacing sodium which is eventually leached out of the profile. **Thio-Sul** and **Nitro-Sul** work in the same way except that the soluble poly-sulfides contained in these materials activate the bacteria much more quickly. The finer the sulfur particle, the quicker this reaction occurs. Most of the pebble-size sized chunks in pop-corn sulfur will take up to five years to disappear.

Sulfuric acid and **N-pHuric** also require free lime but have an instantaneous reaction as the acid is the basis of the material. Sulfuric acid is widely used in Kern County to do micro reclamation of the top 2 to 3" of soil when establishing new alfalfa stands on alkali ground. It also provides some weed control benefit in the right setting and helps to

reduce crusting. Broadcast application of sulfuric acid requires special handling and should not be attempted by the grower. Proper timing/placement of application and leaching for the affected crop is critical to avoid burn or possible sodium toxicity in permanent crops. **You must have a soil analysis to set your rates!**

Lime is used only for acid soils. This condition is found in a few places around the county where decades of fertilizer use and some natural conditions cause low pH; desirable for a potato grower trying to fight scab but not necessarily good for a pistachio orchard. **Dolomite** is a mixture of lime and magnesium carbonate. On some soils magnesium has been found to contribute to a condition the Australians call "hard setting". Other studies have shown that the calcium ion has given better infiltration improvement than magnesium. Some magnesium deficiency does exist in Kern County and dolomite may be helpful. Again, the small cost required to obtain a soil analysis is a wise investment. ■

How much does it cost?

Table 1 compares these materials as to current cost and the tonnage required to meet different gypsum requirements. The tons/acre indicated are based on how much product is required to release equivalent amounts of free calcium ions that correspond to the GR. Impacts on soil pH are not equivalent. Application rates take into account the purity and rough average moisture content found in these products when they get to your field. Freight charges are included but can vary by several \$/ton depending on your location and the material handling. Calculating the requirement for water-run gyp, thio-sul and NpHuric by the standard method of "how much sodium do I want to knock out of the soil", usually overestimates the amount of these materials needed. I have seen several fields where late-season infiltration was much better after 600 to 1500 lbs/ac water run gypsum over the season than when the grower used a 3 ton/ac fall application of pit gyp.

Table 1. Purity, moisture content, field tons and approximate applied cost/acre of various calcium supplying materials to provide for a 1 to 8 ton/acre 100% gypsum requirement. (Reference: local data and Oster, J. et. al. 1992. "Water Penetration Problems in California Soils". Kearney Foundation of Soil Science, Univ of CA. pp.112).

Amendment	Average Purity (%)	Average Moisture (%)	Approx Cost/Ton (applied)	Field Tons & Approx \$/ac to Meet the Following 100% Gypsum Requirements							
				1 ton/ac Tons	\$	2 ton/ac Tons	\$	4 ton/ac Tons	\$	8 ton/ac Tons	\$
Westside Pit Gypsum	50	8	\$14.50	2.17	32	4.35	63	8.70	126	17.39	252
'Lima' Gypsum (Ventacopa	75	4	\$23	1.39	32	2.78	64	5.56	128	11.11	256
Solution Gypsum	92	3	\$75	1.12	84	2.24	168	4.48	336	8.96	672
Ground Wallboard	92	5	\$35	1.14	40	2.29	80	4.58	160	9.15	320
Soil Sulfur (fine + water)*	98	20	\$99	0.24	24	0.48	47	0.95	94	1.90	188
Soil Sulfur ("popcorn")*	99	4	\$104	0.20	20	0.39	41	0.78	82	1.57	163
Soil Sulfur (fine granular)*	99	2	\$109	0.19	21	0.38	42	0.77	84	1.54	167
Sulfuric Acid (applied)*	98	NA	\$110	0.58	64	1.17	128	2.33	257	4.66	513
Thio-Sul*	N-12, S-26	NA	\$135	0.72	97	1.43	193	2.86	387	5.73	774
Nitro-Sul*	N-20, S-40	NA	\$315	0.47	147	0.93	293	1.86	587	3.72	1173
N-pHuric 15/49*	N-10, S-16	NA	\$225	1.16	262	2.33	524	4.66	1047	9.31	2095
Beet Lime**	60	10	\$25	1.08	27	2.15	54	4.31	108	8.61	215

Price assumes freight @ \$7, spreading (where applicable) @ \$2. *Free lime must be present in the soil. **Acid soils only.

Once you take into account moisture percentage, purity, and freight, the spread of some of the material costs is substantially reduced (i.e. the \$99 vs. \$109/ton sulfur is \$3/acre different for a 1 ton GR). The lower purity product may still be the best buy, but keep in mind that the extra baggage that comes with the lower purity may cause its own problems. Pit gypsum and industrial acid/sulfur byproducts can add additional sodium, boron, and chlorides. Since

these are a major concern in permanent and vegetable crops especially, insist that your supplier of amendments tell you just how much of these bad actors are going on to your ground per field ton. If they hedge on giving you these amounts, find another dealer. As a crude comparison, discount the percent of gypsum by three times the percent sodium. ■

Organic amendments—what's the scoop on the poop, or compost, or ?

There are three areas that we try to improve with organic soil amendments: 1) fertility, 2) soil structure & water management, and 3) disease management. Manures, composts, greenwaste, and sewage sludge have a wide degree of variability in how they impact these different areas. The amount

of improvement in soil structure is nearly impossible to predict and usually requires large quantities (>10 ton/ac) to produce measurable changes. The science of understanding disease suppression and microbial benefits as influenced by different organics is still very young. This discussion deals mostly with the equivalent fertility benefit of different materials.

Nitrogen (N) is the core of most grower's fertility programs. Crop needs for this nutrient are well documented and can usually be supplied with

the greatest accuracy by inorganic fertilizers. Release of nitrogen from organic amendments is greatly influenced by the proportion of ammonia, nitrate, organic forms of nitrogen, and carbon in the material. Breakdown and ultimate availability is further affected by the degree of water logging and pH of the soil. A rough rule of thumb (most often used with sewage sludge but applicable to many manures) is to consider all the nitrate (NO_3^-), half the of nitrogen that can form ammonia (NH_3 , NH_4^+ , and urea ($\text{CO}(\text{NH}_2)_2$), and 20% of the organic nitrogen bound up in plant tissue and humus as available the first year. About 10% of the first year's organic N should be available the following year. If only the total N is known than a conservative rule of thumb is to say one third of the total will be available the first year. Organic matter with less than 1% N will release almost no available nitrogen.

As California pushes to recycle more organic materials there are many options for growers to consider, but let's first look at an old standby—fresh and composted dairy manure at 5 ton/ac.

Fresh dairy manure can average 2 to 4% total N on a dry weight basis. About half of this may be ammonia, ammonium, and urea, a small amount as nitrate, and the rest as organic N. Fresh dairy is about 42% dry matter. If we take total N at 2.3% of the dry weight, we get a total of 19 lb. N/fresh ton; say about 2 lb. nitrate, 8 lb. of ammonium and urea, and 9 lb. organic N. Immediate incorporation in moist soil will probably preserve more than half the

ammoniacal N, but as this is often impractical, the all-half-20% rule, described above, is not bad. This means that 1 lb. nitrate + 4 lb. ammoniacal + 1.8 lb. organic N would provide about 6.8 lb. N/fresh ton available to the crop the first year. So out of 95 lb/ac total N applied in 5 fresh tons there may be 38 lb/ac available over two years. A straight third would be about 32 lb./ac available.

On the other hand, composted dairy manure, or aged dairy that was piled up 6 months earlier, may average only 1.3% total N by dry weight. The dry weight percentage of the field run material, however, is now 60 to 70%, instead of 42%. So you don't haul as much water. This means about 18 lb/ton of total N. For this material, more than two-thirds of the N (12 lb. or more) is bound up in the humic (composted organic) fraction. If we assume half of the remaining 6 lb. is ammonium (NH_4), then our formula gives us 3 lb. ammoniacal + 3.6 lb. organic = 6.6 lb. N/field ton available. Over two years, a total of 35 lb. N/ac will be available from a 5 ton application.

So you say, "Wait a minute, here. You mean to say that I'm hauling around 10,000 lb/ac of material to get only 35 to 40 lb/ac of available N? I'm better off with ammonium sulfate! What else do I get with this stuff, and just how much is the final package worth?" ■

How much does it cost?

freight on and spread in the field. This table provides an estimate of total cost to the grower based on average prices for the material, hauling and spreading of a 5 ton/ac application. The approximate value of the nutrients can be misleading if your soil really doesn't need the phosphate or potash right now. These are usually the most costly elements in a grower's fertility program. The good news is that these minerals do not disappear like nitrogen and will simply add to the soil reserves.

Phosphorus and potassium are of course the big additions to this equation. Table 2 shows how much total N-P-K might typically be found in a variety of materials. (The values listed are from materials used in Kern County.) Lab reports often give concentrations on a dry weight basis, but it's the wet stuff you've got to pay

Table 2. Pounds of nitrogen, phosphate, and potash per 5 field ton/acre application of various organic materials. Equivalent \$ value is based on prices listed in footnotes. The value of available N is calculated on the basis of 20% organic N available the first year and 10% available the second year for a total of 30%. (Organic N = Total N - (N as NH₄ + NO₃)).

Nutrient Value and Cost @ 5 Field ton/ac						² Approx	Value of Nutrients	Net Cost
Material	Total N	NH ₄ & NO ₃	P ₂ O ₅	K ₂ O	Dry Matter	¹ Approx Cost		
GinTrash Compost	108	2	15	106	48 %	\$140	\$34	\$106
Aged Dairy Manure	91	7	47	205	72 %	\$60	\$63	(\$6)
Composted Dairy	105	32	90	188	75 %	\$83 - 135	\$76	\$2 - 54
Digester Biosolids	135	23	46	3	23 %	\$0	\$24	(\$27)
³ Biosolids & Green Waste Compost	105	35	121	117	71 %	\$108	\$68	\$40
Raw Greenwaste	69	0	15	43	54 %	\$60	\$17	\$43
Grnwaste Compost	84	1	41	90	69 %	\$95	\$35	\$60

¹ Gin trash compost @ \$18/ton, dairy @ \$3, dairy compost @ \$7.50 - \$18, biosolids @ \$0 (includes trucking and spreading), biosolids/greenwaste compost @ \$12.50, yard trimmings @ \$3 (for grinding), greenwaste compost @ \$10, freight @ \$7, and spreading @ \$2.

² Using the following per unit values: N @ \$0.20, P₂O₅ @ \$0.24, and K₂O @ \$0.22.

Available units N calculated as 100% of NH₄ & NO₃ + 30% of remaining organic N.

³ San Joaquin Compost, Eko, and Kellogg's Amend are in this category.

It is nearly impossible to list a value associated with the supply of zinc, iron, copper and other micronutrients. More often than not, it is the benefit of these extra 'goodies' and the impact on the soil microbiology that growers are counting on. The availability of some of these nutrients when supplied by manures and composts can be superior to that of soil applied fertilizers. A five ton/ac application of biosolids (sewage sludge) might have 5 to 10 pounds of chelated iron and zinc.

At the end of the day the grower needs to look at the 'Net Cost' column and decide if the amendment of his choice will pay for itself with

better crops over the long haul. Dairy manure is a good bet on hard cotton ground when you need K and the haul is cheap. The table shows why some growers have become interested in biosolids. Applications are usually made at 12 to 25 wet tons/ac at no cost to the grower, who then saves \$20 to \$30 on his N fertilizer alone. In addition to organic based amendments, crop rotation, cover crops and green manures have a beneficial effect on soil tilth, microorganisms, fertility, and water management. University of California Publication 21505, "Organic Soil Amendments and Fertilizers" provides some useful information. ■

Results in Kern County

Crusting: Crusting of the soil can cause stand establishment problems for many crops. **Figure 2** shows how greenwaste compost and even a light application of 500 lb/ac popcorn sulfur significantly improved emergence of alfalfa south of Lamont on a slightly alkaline loam soil by decreasing crusting. The material was applied over the top of the finished seedbed and the seed drilled through it into the top ½" of soil. This keeps the amendment concentrated in the area where it's most beneficial – at the surface. This is probably more important for onions and carrots than alfalfa, though, since alfalfa stands thin out to only 12 to 18 mature plants/sq. ft. for optimum yield. Both of Kern County's major carrot packers have been using 2 to 3 tons compost, often mixed with gypsum or sulfur, on many of their fields over the last couple of years.

Infiltration: So what have we seen in Kern County? Three ton/ac of dairy manure and 2 ton of pit gyp have been a time-honored standard on potato ground for decades. **Figure 1** illustrates the benefit of combining organic matter (sewage sludge in this case) with a

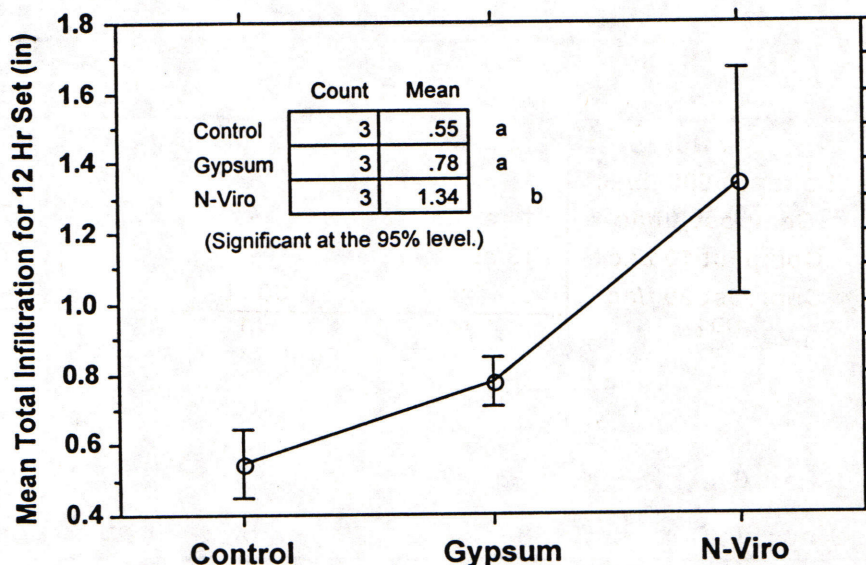


Fig 1. Cumulative infiltration for last irrigation in cotton for 4.5 ton/ac N-Viro Soil, 3.5 ton/ac Lima gypsum and untreated (Control) silty clay loam soil in the Kern Lake bed.

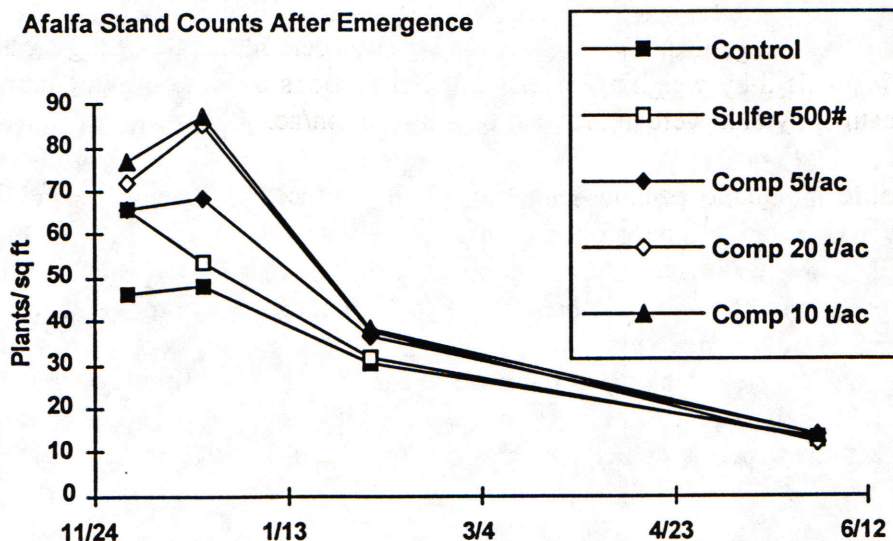


Fig 2. Benefit to alfalfa emergence after fall application of greenwaste compost and sulfur and final stand counts the following spring.

Nutrients: So what about “building up soil nutrient reserves” with organic matter amendments? Table 3 shows the increase in available P, K, Zn and Fe reserves over three years of greenwaste compost application on a course sandy loam south of Lamont. Other micronutrients also increased, but not as significantly. The high rate of compost application about doubled these four nutrients, but it took 60 field tons/ac over three years.

Table 3 Change in soil nutrient levels for phosphorous (P) as phosphate, potassium (K) as potash, zinc (Zn) and Iron (Fe) over three years of fall greenwaste compost and sulfur application on a sandy loam field near Lamont. Numbers followed by different letters indicate the results are significantly different with 95% confidence. Calibration errors due to excessively high absolute values required a change in analytical labs in March 1996, but the trends from both labs remained the same.

Phosphorous (ppm)					Potassium (ppm)				
	Cotton 5/16/95	Garlic 2/19/96	Garlic 3/15/96*	Cotton 8/5/97		Cotton 5/16/95	Garlic 2/19/96	Garlic 3/15/96*	Cotton 8/5/97
Control	13 ab	24 ab	20 a	27		368 ab	309 a	152 a	140 a
Sulfur @ 500 lb/ac	10 a	22 a	-	27		362 a	288 a	-	154 a
Compost 5 t/ac	10 a	23 a	-	26		375 ab	355 ab	-	186 a
Compost 10 t/ac	13 ab	22 a	-	35		374 ab	340 a	-	177 a
Compost 20 t/ac	15 b	30 b	30 b	43		446 b	420 b	231 b	242 b
LSD 0.05	4.4	6.8	9.1	18		84	70	53	50

Zinc (ppm)					Iron (ppm)				
	Cotton 5/16/95	Garlic 2/19/96	Garlic 3/15/96*	Cotton 8/5/97		Cotton 5/16/95	Garlic 2/19/96	Garlic 3/15/96*	Cotton 8/5/97
Control	6.4	8.0	1.6 a	2.2 a		55	33 a	5.8 a	9.8a
Sulfur @ 500 lb/ac	5.5	6.6	-	2.2 a		46	32 a	-	11.0a
Compost 5 t/ac	6.3	7.7	-	3.2 b		58	34 a	-	12.5ab
Compost 10 t/ac	6.5	8.0	-	3.6 b		65	37 ab	-	15.0 bc
Compost 20 t/ac	7.0	8.8	2.6 b	4.6 c		52	43 b	9.8 b	16.8 c
LSD 0.05	1.6	2.6	0.61	0.89		22.0	8.7	1.8	3.6

*Switched to different lab in spring 1996. Only control and 20 t/ac plots tested.

Yield: Finally, what can we say about yield? Table 4 shows the quality characteristics for fresh garlic for the first and second years following compost application to the same sandy field described in Table 3. There is a slight increase of % large garlic and weight per 100 marketable heads with compost application, but it's not statistically significant. Total field tonnage was determined following the second year of compost application to a loam field by weighing several 25 foot sections of windrow (including dry tops) for each plot. Compost treatment yields were higher, but only by 0.3 ton/ac.

Table 4. Quality packout for garlic in first and second years after annual fall application of greenwaste compost and sulfur at indicated rates. Numbers followed by different letters indicate the results are significantly different with 95% confidence.

	Sandy Loam (Year 1)			Sandy Loam (Year 2)			Loam (Year 2, white only)		
	Marketable			Marketable			Marketable		
	Large (% total)	Jumbo (% total)	Heads (lbs/100)	Large (% total)	Jumbo (% total)	Heads (lbs/100)	Large (% total)	Jumbo (% total)	Yield (ton/ac)
Control	46.2 a	6.8	9.0	31.3	9.0	6.9	40.0	17.0	7.84 ab
Sulfur @ 500 lb/ac	52.5 ab	6.2	9.0	37.3	2.8	6.3	42.9	12.7	7.03 a
Compost 5 t/ac	51.2 ab	4.8	8.8	42.0	3.6	6.7	36.3	23.8	8.15 b
Compost 10 t/ac	44.2 a	4.5	7.6	39.6	6.6	6.6	36.7	12.4	8.08 b
Compost 20 t/ac	58.8 b	7.5	9.7	33.5	4.8	7.2	40.5	8.8	8.15 b
LSD 0.05	11.0	7.2	2.5	13.8	8.8	1.0	12.9	11.6	0.93

Where do I get it?

Many of you are well acquainted with the various bulk amendment dealers around the county. Some of these dealers interconnected and field reps change. But for those of you wondering about some of the different possibilities, below is a list of suppliers/field reps to help you do your homework in locating the "right stuff". They are not always in the Yellow Pages. Included are suppliers of different composts and manures. Acid work is a specialized application. Many of the local fertilizer dealers also carry bagged or liquid product. This list is for bulk amendments. No commercial endorsement is intended and I apologize in advance to anyone not included in the list. Let me know and any corrections will be in the next newsletter.

SUPPLIERS/FIELD REPRESENTATIVES

Ag Gypsum Recycling 758-2318
American Ag 635-0778
Barksdale Fertilizers 333-1856
DARO Commodities 589-7457
Earthwise Organics 800-661-7922
Hargis & Sons 397-7195
H. M. Holloway 399-6114
Hondo 589-1042
Andy Sharp 332-5493 (*acid*)
Verdegaal Bros 800-845-8728 (*acid*)

UPCOMING MEETINGS

Advances in Irrigation - November 17, 1999
Kearney Ag Center, Call UC Davis 530/757-8777

Pest Science Conference - December 14-15, 1999
UC Davis, Call 800/752-0881

California Alfalfa Symposium - December 8-9, 1999
Fresno, Call Nikke Picano 530/752-0700

USEFUL REFERENCES

Agricultural Use of Wood Ash in California
UC Publication #21573, Cost \$5.00

Agricultural Salinity and Drainage
UC Publication #3375, Cost \$25.00

Organic Soil Amendments
Publication #21505, Cost \$5.00

Water Penetration Problems in California Soils
Kearney Foundation, UC Riverside 909/787-5100

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SALINITY MANAGEMENT IN THE SAN JOAQUIN VALLEY

University of California Cooperative Extension Office Conference Room

1031 South Mt. Vernon Avenue, Bakersfield CA 93307

Thursday, November 4, 1999

8:30 a.m. to 3:00 p.m.

As water and land costs in the San Joaquin Valley continue to climb, growers are attempting to shift ground from field crops into higher value vegetable and permanent crops. Much of this is being done on marginal soils with salinity and alkalinity problems. University of California Cooperative Extension is proud to offer this seminar to provide growers and others in the ag industry with the tools to make intelligent decisions when it comes to managing salinity. The course will use the UC manual "Agricultural Salinity and Drainage" and include a few exercises, with examples from Kern County.

Instructors: *Blaine Hanson, UCCE Irrigation Specialist, UC Davis*
Steve Grattan, UCCE Salinity Specialist, UC Davis
Blake Sanden, UCCE Irrigation & Agronomy Farm Advisor, Kern County

AGENDA

- 8:30 a.m. **Registration**
- 9:00 a.m. **Understanding the Chemistry** - Reading lab reports, understanding the terminology
- 9:45 a.m. **Crop Response** - Salt tolerance, boron, chloride and sodium toxicity
- 10:40 a.m. **Break (Refreshments)**
- 11:00 a.m. **Water Quality and Infiltration** - Salinity impacts on soil structure and water penetration.
SAR, ESP. Exercises
- 12:00 p.m. **Lunch**
- 1:00 p.m. **Assessing Suitability of Irrigation Water** - Checking the quality of lab data, salinity and specific ion problems
- 1:30 p.m. **Leaching Requirement** - Maintenance and reclamation
- 2:15 p.m. **Amendment Options** - Gypsum and other injection alternatives. Broadcast amendment options. Examples from Kern County/Exercises.

Continuing Education Units: 5 Hours CA Certified Crop Advisor will be applied

REGISTRATION: \$35.00 (Lunch and UC Manual, "Agricultural Salinity and Drainage")
\$10.00 (Lunch, if you already have the UC Manual, "Agricultural Salinity and Drainage")

PRE-REGISTER BY FRIDAY, OCTOBER 29, 1999

☐ \$35—Lunch/Refreshment and UC Manual

☐ \$10—Lunch and Refreshments

NAME(S) _____

PHONE _____

NUMBER PERSONS ATTENDING _____

TOTAL AMOUNT ENCLOSED _____

Please make checks payable to: **REGENTS OF THE UNIVERSITY OF CALIFORNIA**

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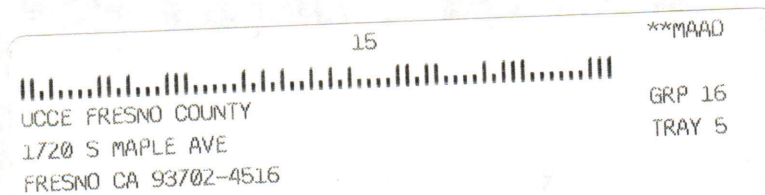


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