From the Ground Up

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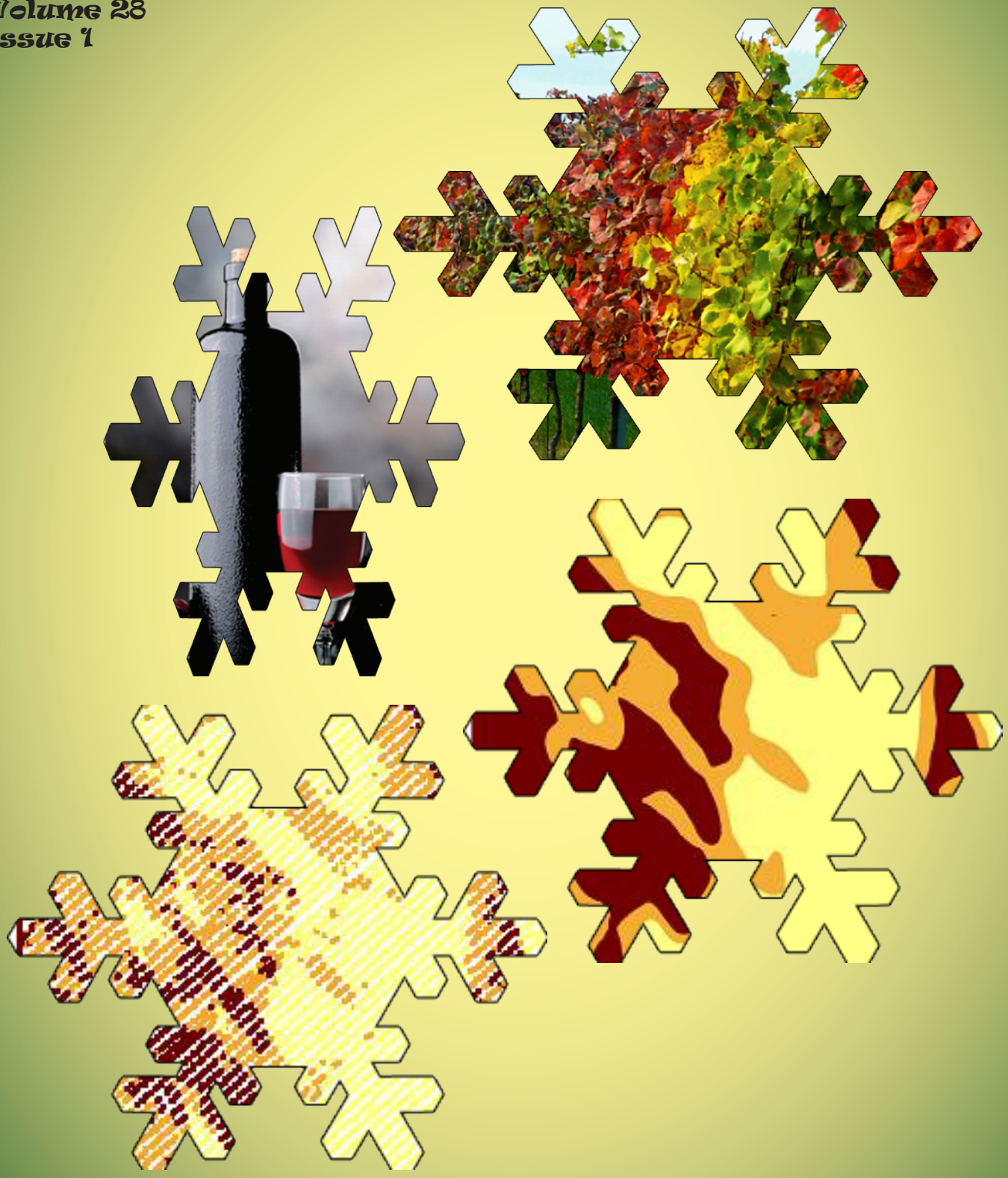

Newsletter of Soil & Crop Extension at Colorado State University

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Fertilizer Prices: Big Changes Ahead
by Gary Hergert

The past two years have seen major changes in crop production costs, especially fertilizer. What happened and what's projected for 2009? That depends on the world market. Fertilizer is truly an international commodity, so what happens in the Middle East, India, China and former Soviet Union Republics like the Ukraine (Yuzhny) influences local prices.

Nitrogen

Nitrogen prices tripled compared to two years ago in September, but have dropped just like the stock market since then (*Figure 1*).

World demand for fertilizer rose 14% in the past few years (primarily from South America, China and India) which drove up prices. With increases in U.S. ethanol production, corn acreage and nitrogen demand increased (45% of all N fertilizer is used for corn). When the financial crisis spread around the world in September, it also affected demand for fertilizer, causing the huge price drop in world prices shown in *Figure 1*. Local prices will be at least 20% higher to reflect transportation and dealer mark up.

In the U.S., ammonia for fertilizer accounts for only about 2% of total use which is primarily industrial. Historically, the price of ammonia is strongly correlated with natural gas prices because 85-90% of the production cost of ammonia is natural gas. Industrial ammonia is used to produce nylons, acrylonitrile for fibers and plastics, isocyanates for polyurethanes, hydrazine and explosives. Industrial ammonia use is reflecting steep declines due to decreased use tied to the U.S. housing and construction slump along with automobile, pulp and paper industries decreased use.

Demand for ethanol has declined with the drastically decreased crude oil and gas prices. Late harvest, high prices and wet soils limited Corn Belt nitrogen application this fall to about 50% of normal. All of these factors have led to excess supply (industrial and fertilizer) in the U.S. and the world and are reflected in world prices (*Figure 2*).

So, why haven't you seen a decline in prices at your local supplier? The problem is that dealers have high-priced inventory in bins and tanks they are waiting to sell. Many bought before peak prices last summer, but now will have to see if they can "cost average" to help bring down costs, knowing there is cheaper product on the market. Dealers cannot sell those products below their cost or they will not be able to stay in business. Barge traffic up the Mississippi was closed for winter, storage is full, and there are tanker ships sitting off Tampa full of ammonia that is being offered for less than $200/T, but there are no buyers and no place to move it.

Phosphorus

Phosphate prices quadrupled since two years ago before dropping again. China and India had bid up the market to $1200/ton for 18-46-0 (DAP) this summer. The Chinese put an export tax on nitrogen and phosphorus last year, but dropped in December-January 2009, trying to encourage buying. Other major world companies (Yara, Agrium, Koch, Terra) have curtailed production in Europe, Canada, the Caribbean and the U.S., but there is too much excess supply for production cuts to affect prices in the short term.

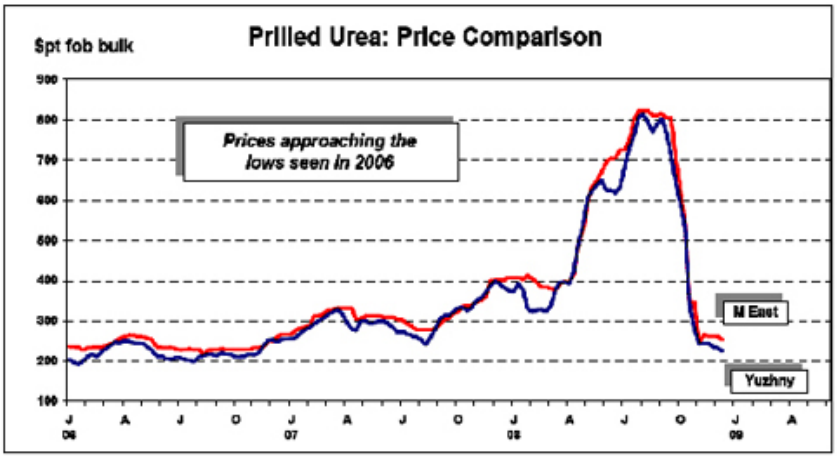


Figure 1

Recommendations

As you plan for 2009, fertilizer prices will be fluctuating and may be higher than in 2008, although there may be some bargains later in the spring. You can't control fertilizer prices (other than being aware of world trends and locking in a good deal when you find one) and you can't control commodity prices. What you can control are your production inputs and costs by improved management.

The keys to maintaining profitability are to know your soil test levels and do the best job of fertilizer application to

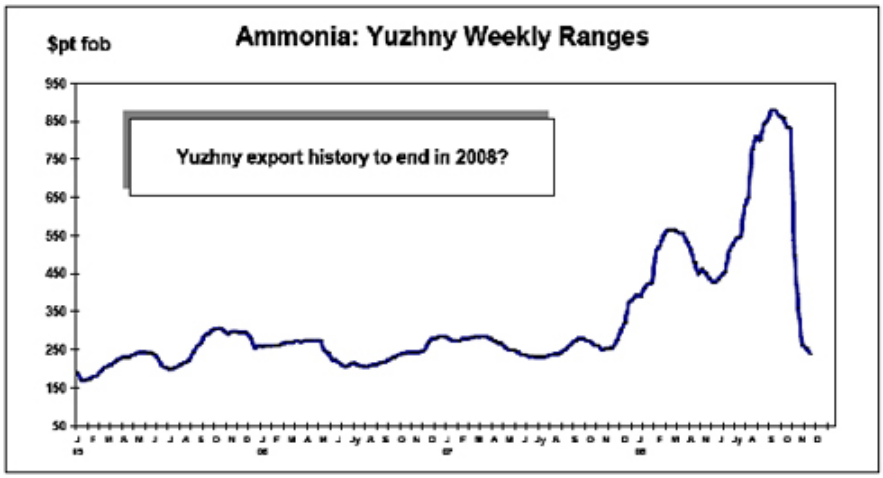
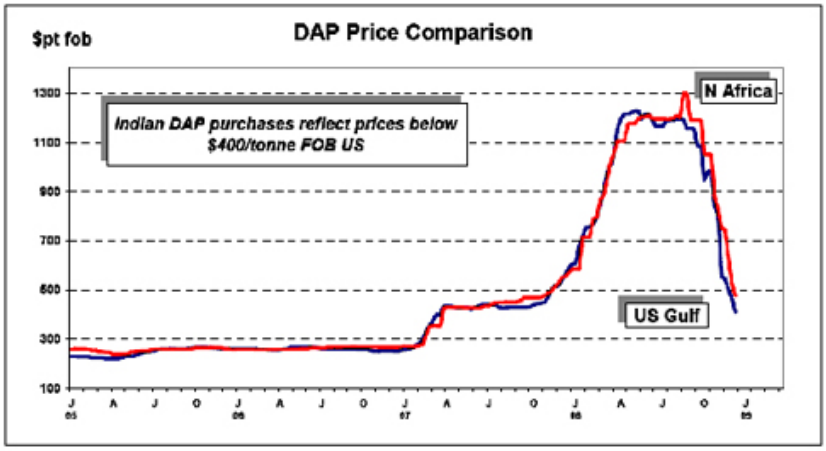


Figure 2



enhance efficiency. A new Web site to develop fertilizer recommendations based on UNL criteria can be found at http://soiltest.unl.edu.

Source: Gary Hergert, Extension Soils Specialist, Panhandle REC, Scottsbluff, Nebraska Ag Extension

*Article reprinted with permission from CropWatch.

Meet the Faculty- Dr. Allan Andales

Dr. Allan Andales joined the Department of Soil and Crop Sciences in August, 2007 as an Assistant Professor. He has Agricultural Engineering (Soil and Water emphasis) degrees from the University of the Philippines (BS) and Iowa State University (MS and PhD). He has worked as an Assistant Professor of Agricultural Engineering at the University of the Philippines at Los Baños, as a postdoctoral fellow working on irrigation of pecan trees at New Mexico State University, and as a Soil Scientist with USDA-Agricultural Research Service-Agricultural Systems Research Unit in Fort Collins, Colorado. His primary research activities with USDA focused on computer modeling of agricultural systems (cropland and rangeland) and related field measurements to characterize these systems. Allan has 14 years of experience in developing and using computer simulation models for field applications such as irrigation scheduling and improved management of cropping or rangeland livestock systems.

Allan has research, teaching, and extension responsibilities in the areas of irrigation and water science. His teaching responsibilities include SOCR380 (Irrigation Principles) and SOCR381 (Irrigation of Field Crops). Allan's primary research interests are in conserving soil and water resources. He is currently involved in the determination of crop consumptive water use with the weighing lysimeters at Rocky Ford, CO. He is also using computer simulation models of soil-plant-atmosphere systems to analyze limited irrigation strategies and extend site-specific research findings to other locations, management practices, or climate scenarios. Allan is also collaborating with members of the CSU Extension Water Resource Management Team to address agricultural and urban water issues in Colorado.

Establishing a Commercial Vineyard
by Bruce Bosley

Grape production is a risky crop enterprise in Colorado. It's all about the site and cultivar. To be successful, a winery must have a ready source of consistently high-quality fruit available every year. Some Colorado locations provide suitable soils, water and abundant sunshine; experience of growers and University research has shown that there are sites suitable for growing hybrid grapes of excellent quality for wine production. Increased interest in grape production and winery development in Colorado has potential growers asking for detailed information on vineyard establishment.

Do your homework

Viticulture (the culture of grape growing) is unlike most other types of agriculture. Before embarking upon this potentially risky venture, gather as much information as you can. Read trade journals and research articles, attend grower workshops and conferences. Visit other growers' vineyards and gain from their experience by asking about their approaches. Most Colorado growers should focus their research on Midwest U.S. regional resources. Develop a business plan that will give you a road map of where you are going and how you will get there; where do you want to be in five years, in ten years?

Site Selection

Colorado's dry climate and fluctuating mild winter temperatures exacerbate winter damage especially when vineyard soils are dry prior to freezing in the fall.

Selection of an appropriate site is essential to the success of the grape production enterprise. Three main factors are critical to selection of an acceptable vineyard site: cold temperatures, air movement and soil drainage. Low winter temperatures may directly damage the vines and buds or even kill the grape plants, while abrupt temperature drops in the fall, winter, or spring may also cause severe injury. Of special concern are temperature fluctuations in late winter/early spring that lead to early bud break and subsequent bud damage. Sites that have adequate air drainage and movement will aid in diminishing the negative effects of frost and disease. Of equal importance is good soil drainage. The old adage that grapevines cannot stand "wet feet" is on target; that is, poor soil drainage reduces available air to the roots. This lack of air means that oxygen is not available to the root cells and may lead to root death.

Climate

Generally speaking, the best vineyard site is one with full sun exposure, good air drainage, good soil drainage, along with freedom from late spring frosts and harsh winter temperatures. Climatic characteristics are generally broken down into microclimate, macroclimate, and mesoclimate. Microclimate is the climate in the immediate vicinity of the grapevine, its roots, stems, and especially in the plant canopy. Macroclimate is primarily dictated by geography, such as western slope valleys versus eastern slope foothill valleys versus northern or southern high plains.

Minimum winter temperatures, length of growing season, growing degree days and rainfall amount and distribution are all macroclimatic factors. Growers can modify the microclimate in the canopy using vineyard practices such as a training/trellising system, pruning practices, fertilizer applications, leaf removal and shoot positioning. Disease severity and fruit quality can be improved dramatically by practices that influence microclimate. Microclimate is mostly a result of factors such as topography and slope, elevation above surrounding land, soil type and aspect or direction of slope.

Cultivars, or varieties, vary greatly in their tolerance of cold winter temperatures. Elevation and local terrain are two factors that contribute to winter temperature fluctuations, which vary greatly

at different locations in Colorado. Most cold-hardy hybrid grapes grown in a vineyard cannot withstand a temperature below -20F (-28C) for an extended period of time; the plant may be severely damaged or killed. Therefore, carefully select cultivars to match their cold-hardiness to the site selected. European-American hybrids offer the hardiest selections.

Midwest researchers recommend that vineyards be located where the frost-free growing season is longer than 161 days, the longer the better. Colorado's dry climate, however, may make up some differences due, in part, to our cooler summer nights and ample sunshine. Wine and table grapes may succeed in areas that are in USDA plant hardiness zones five or six.

The mesoclimate or vineyard site characteristic is important to choosing a site that is likely to offer freedom from spring frosts. Ideally, the site should be gently sloping and at a higher elevation than surrounding areas. Because cold air is heavier than warm air, cold air flows downhill to lower areas, thus reducing frost risk. In addition, air drainage during the growing season leads to rapid drying of foliage following rain or heavy dew. This in turn reduces conditions conducive to disease development. Steep slopes should be avoided because of potential soil erosion problems. Furthermore, obstructions such as wooded areas and windbreaks at the edges of the vineyard site should be avoided so that the cold air will not "pond" into frost pockets in the lower parts of the vineyard. Such areas may also harbor damaging wildlife such as birds, deer and other grape pest species.

Aspect of slope, or the direction a slope faces, is also important in site selection. Choice of slope may relate to cultivar selection—cultivars exhibiting early bud break will benefit from north or eastern exposures. Although a south-facing slope is warmer, it causes early bud break in the spring which may lead to late frost bud damage. Undesirable fruit characteristics for winemaking may be caused by early fruit maturation occurring on southern slopes, which may lead to ripening during excessively hot periods. Eastern slopes dry faster in the morning following dew or rain, thus reducing disease problems. North slopes will have later bud break in the spring, but will be colder in the winter. Winds may have potentially damaging impacts on western or southwestern exposures, depending on direction of the prevailing winds.

Soils

A wide range of soil types are satisfactory for growing grapes, with the exception of poorly drained soils (the "wet feet" problem mentioned earlier). Soils that will support root growth possess good aeration, moderate fertility, loose texture, good drainage (both internal and surface) and acceptable depth (preferably at least 40 inches, with no impeding layer). Soil drainage is one of the most critical factors in site selection.

A well- drained sandy loam soil is ideal for grape root development. Grape roots may penetrate to depths of 10 feet or more in well-drained soils, but may be restricted to two feet or less in poorly drained soils. Poorly drained soil causes poor root growth, resulting in slow vine growth, poor yields and reduced vine vigor, and ultimately a lack of longevity. If the poor drainage is the result of an impervious layer such as a hardpan or plow pan, "ripping" (sub-soiling) the soil exactly where you will place the rows is recommended. It may also be helpful to rip at right angles to the row orientation. If the poor drainage problem is related to heavy soils with inadequate internal drainage, it may be advantageous to install drainage tile. Extremely poorly drained soils will be prohibitively costly to correct and should be avoided.

Conduct a Soil pH Test

Grapes grow well over a relatively wide range of pH, organic matter and fertility levels. Centuries of grape growing experience in Europe and the Middle East have shown that grapes will thrive on poorer soils compared to other crops. Consequently, vineyard

producers have traditionally grown vineyards on rocky and sloped ground. They reserve their richer bottomland soils for growing grains, forages, and vegetable crops. However, western soil conditions can introduce plant health problems, especially where soil pH is high. Grapevines tolerate soil pH levels of 5.0 to 8.0, but the ideal is between pH 5.5 and 6.5. A few cultivars are more sensitive to high pH-induced nutrient deficiencies such as iron so select varieties that tolerate these soils. A good range for organic matter is from one to three percent. Very high organic matter may provide excess nitrogen, resulting in very vegetative, soft growth that is highly susceptible to winter injury and often may cause low fruit yields and quality.

Grapevines require good phosphorus nutrition. However, Colorado soils are normally somewhat to very deficient in phosphorus. Therefore, good phosphorus fertility management is essential. Occasionally, phosphorus, magnesium, zinc and boron levels may be below optimum amounts for grapes. If levels of these elements are close to the recommended ranges, the grower may wish to defer application until after the first year of growth. Foliar tissue tests are the best way to monitor the nutrient status of vines. Annual tests will assist the grower in future years' fertilization practices.

Adapted from Paul Read, University of Nebraska Professor of Viticulture & Enology

The Department of Soil & Crop Sciences has a new webpage! Please visit our new site at: http://www.soilcrop.colostate.edu for the latest departmental news and information about our programs.

We need your input!!!

We are conducting a survery about our newsletter. Please help us to continue improving the quality of our newsletter by providing us your opinion.

The survey is very short (only 8 questions) and should take under 5 minutes.

To take the survey go to: http://www.surveymonkey.com/s.aspx?sm=bGP0DXx4C53c2hSSfbHZeg_3d_3d

Your comments and input are very valuable and we appreciate your time. Thank you!

If you have any comments or suggesstions please feel free to email them anytime to : Kierra.jewell@colostate.edu. She can also be reached via phone at (970) 491-6201.

Winegrapes for Colorado's High Plains Region
by Bruce Bosley, Morgan & Logan Extension Agent, Cropping Systems & Natural Resources

Growing wine grapes in Colorado is challenging because of our short frost-free growing season. With the exception of a few Western Slope locations, European wine grapes are not hardy in our climate. This list of grapes is a guide to varieties that may survive in selected low elevation (>5,500 ft.) growing areas and produce annually. Growers improve their chances of raising any of these grape varieties through selecting growing sites on a slope well above the river bottoms for favorable cold air drainage. A 3% grade is normally enough. Avoid placing them above a windbreak, wall, or other confine that can hold cold air around the grapes forming a frost pocket. Top avoid sunscald in the winter, East-facing slopes are preferred over Southwest slopes. This list of grape varieties is based on western Nebraska vineyard growers' experience and University Extension variety trials. As such, they serve as a guide for grape trials in Colorado.

Brianna–Elmer Swenson introduction: it is a cold-hardy white wine grape that is easily managed in the vineyard and appears to tolerate 2,4-D drift. It can make a pleasant semi-sweet white wine with tropical fruit aromas in the bouquet.

deChaunac–French-American red hybrid: it is hardier and more disease resistant than many other F-A hybrids and has been made into excellent deep red, full-bodied wines. Smallish berries are borne on medium sized, somewhat loose clusters.

Edelweiss–Elmer Swenson introduction: vines show strong vigor producing large loosely formed clusters of white grapes. The best wines from these grapes are picked at 14.5 to 15.5 Brix level. The plant is very disease resistant and somewhat 2,4-D tolerant.

Frontenac–U of Minn: this a potentially high yielding later ripening red wine grape. It will produce a loose, medium to large cluster of blue-black medium sized grapes. It appears that over cropping could become a concern and cluster thinning may be necessary, both for fruit quality and vine vigor the coming season. It has exhibited good disease resistance but is one of the first to show leaf phylloxera, which does not appear to significantly slow the plants growth.

Frontenac Gris–A mutation of Frontenac: the vine is nearly identical to Fontenac, but the fruit is grayish in color when ripe. It has been made into excellent, fruity off dry and semi-sweet white wines.

GR7–Cornell: an early to mid-season red wine grape. It is used use primarily in red wine blends. It is distinguished from other red wine grapes grown in cool climates by its high degree of hardiness, adaptation to mechanized production systems, and ability to survive in older plantings where red wine grapes are lost due to tomato and tobacco ringspot virus infections. GR7 is a highly productive, easy to manage cultivar.

Lacrosse–Elmer Swenson: it is very winter hardy. Lacrosse is disease resistant and tolerates 2,4-D. The vines have proven to be of medium vigor and very productive, producing a light medium size cluster of white skinned grapes. A versatile grape that can be made into a wide range of wine styles of excellent quality.

LaCrescent–U of Minn.: a white wine grape that displays good vigor. It produces long somewhat loose clusters of small berries that turn golden in color as they ripen. It has made excellent fruity wines.

Leon Millot: this vine produces small, somewhat loose clusters of blue-black berries that are among the first to ripen in the season. This cold hardy cultivar should be adapted to Eastern Colorado's High Plains region. It produces a quality wine that is good for blending.

Marechal Foch: a relatively cold hardy grape and is one of the most popular and widely planted

red French-American wine grape hybrids raised in the Midwest. Clusters are small, often tight, but can be highly flavored. It produces fruity, non-foxy wines similar to Pinot Noir.

Marquette–U of Minn: this vine is easily managed in the vineyard, has moderate disease resistance and can be vinified into a complex fruity wine of excellent color. It breaks bud in the spring about the same time as Marechal Foch.

Prairie Star: extremely winter hardy (to -40F), Disease resistant other than Anthracnose. Prairie Star makes a neutral varietal wine in most years. It is currently used to add body and finish to other white wines.

Saint Croix–Elmer Swenson: a vigorous vegetative red wine grape cultivar. It produces red wine grapes in medium sized slightly loose clusters. Because of its vigor, it is important to leave a sufficient number of buds to encourage good crop production levels to balance its potentially excessive vegetative growth. It appears to have moderate to good disease resistance and has excellent cold hardiness.

Valiant: this is one of the coldest tolerant grapes grown in the High Plains. It matures very early and produces attractive blue-black berries borne on compact 4-inch clusters. It is excellent for grape juice and jelly. Its wines have the sweet characteristic foxiness found in Lambrusca and Muscadine grape wines.

Vignoles: this grape is a good performer with nice promise. It has shown good cold hardiness in recent year's trials. It produces small grape clusters so diseases may become an issue and yields may only be moderate. This grape makes high quality wines.

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Events

Rocky Mountain Compost School
April 14-17th, 2009
Fort Collins, CO
www.rockymountaincompostschool.info

Links and Resources

Institute for Livstock and the Environment:
www.livestockandenvironment.info

Ammonia Best Management Practices:
www.ammoniabmp.info

Rocky Mountain Compost School:
www.rockymountaincompostschoo.info

Colorado State University's Crops Testing Program:
www.csucrops.com

Manure Management Program at CSU:
www.manuremanagement.info

CSU Extension Water Quality Program:
www.csuwater.info

CSU Extension Precision Agriculture:
www.precisionag.colostate.edu

Zone Soil Sampling: A Smart Way To Quantify In-Field Variability For Crop Management

by Raj Khosla and Dale Shaner

In the days of fluctuating commodity prices and ever increasing input prices (such as nutrients, seed, etc), it is important to seriously consider the contribution of important nutrients such as nitrogen, phosphorus and potassium that may reside in soil. Incorporating residual soil nutrients up-to the depths of 24-inches or even 36-inches as an integral part of fertilizer recommendation could significantly reduce the amount of addition fertilizer needed for the crop.

Soil sampling is a primary tool that has been used for decades for measuring fertility status of soil. However in more recent times, since the advent of precision agriculture, more intensive techniques of quantifying soil parameters such as grid soil sampling techniques have been proposed by scientists and utilized by practitioners. There have been a number of constraints associated with grid soil sampling as reported by practitioners and producers. These include but are not limited to (i) cost of sampling, (ii) skilled labor needed for grid sampling, and (iii) time involved. Alternative techniques of quantifying soil variability such as "*site-specific management zones*" have been developed and evaluated by scientists at Colorado State University and elsewhere in the country. It is now widely documented that site-specific management zones successfully and accurately characterize in-field soil variability.

Site-specific management zones are sub-regions of a field that show a homogeneous combination of yield limiting factors. These sub-regions of the field can be managed with uniform application of nutrients within that sub-region or the zone. Such crop management is referred to as "*site-specific crop management*" and is based on the premise that a farmer can identify the spatial variability within a field and then exploit that information to design better management practices. Some of the biggest variables in a field are the physical and chemical properties of the soil which can influence crop production. However, the identification of the spatial variability of these soil properties within a field is a formidable challenge.

Scientists at Colorado State University and Agricultural Research Services recently completed a study that suggests a new cost effective approach of mapping in-field soil variability for crop management when compared to intensive grid soil sampling. This new approach to mapping in-field soil variability is called Zone Sampling. In zone sampling a field is divided into homogenous areas (zones) using an easy to measure ancillary attribute (e.g. apparent soil electrical conductivity or EC_a) Figure 1. (Refer to CSU Extension factsheet 0.568, Soil Electrical Conductivity Field Mapping: A New Tool to Make Better Decisions) and a few (2 to 4 composite) soil samples are taken

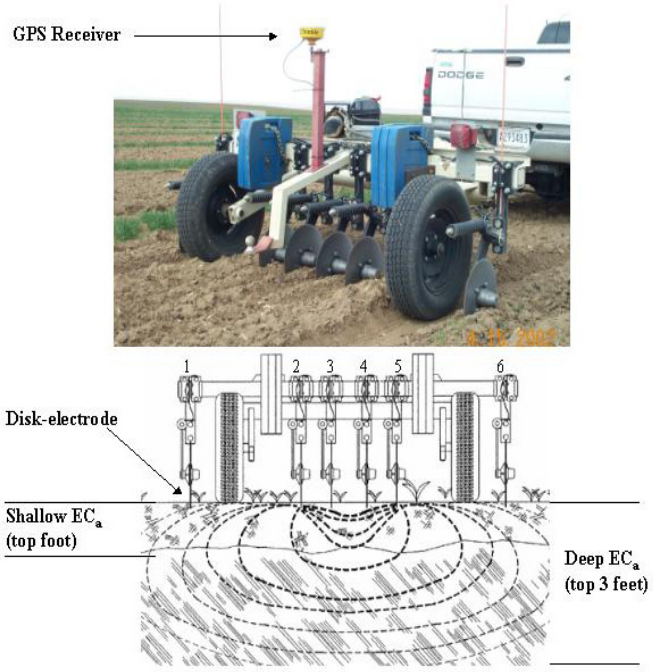

Figure 1

from each zone to estimate the soil characteristics in each zone.

The recent study conducted on two north-eastern Colorado farmers' fields, compared the accuracy of soil parameters as determined by soil electrical conductivity based on zone soil sampling against the more intensive grid soil sampling technique (Figures 2 and 3). The study found that zone sampling correctly predicted the soil texture and organic matter approximately 80% of the time when compared to grid soil sampling within the two fields. The study findings support the utilization of soil electrical conductivity based zone sampling as an alternative to grid soil sampling, as a more efficient, quicker and a cheaper mechanism to quantify in-field soil variability for crop management.

As the temperatures warm and we welcome the new Spring season, it will be an appropriate time to consider soil sampling prior to planting new crops. Considering smart sampling or zone sampling on some of your fields (if not all) could aid in saving a few extra $ that could be invested elsewhere. In such unprecedented economic times, fluctuating commodity prices and high input prices, the proverb "*A penny saved is a penny earned*" couldn't be more appropriate.

Complete and more detailed information on the zone sampling study can be found in the following publication by Drs. Dale Shaner, Raj Khosla, M. Brodhal, G. Buchleiter and H. Farahani., 2008. How well does zone sampling based on soil electrical conductivity maps represent soil variability? Published in Agronomy Journal volume 100, issue 5, page 1472- 1480. Alternatively, you can request a copy of the paper from the authors of this article.

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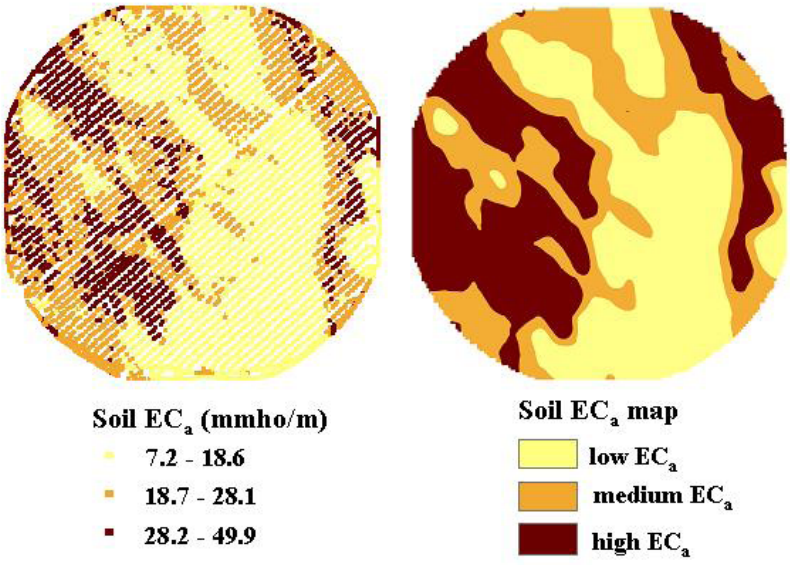

Figure 2

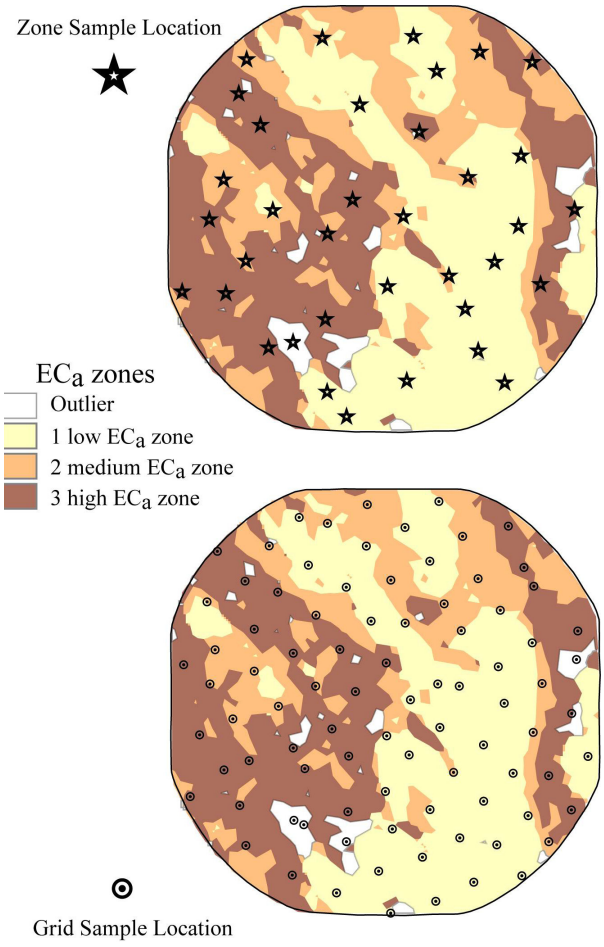

Figure 3

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