



## CalCAN Farm Field Day Climate Change & Agriculture Resources

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These resources were compiled as a follow up to a farm field day on April 9<sup>th</sup>, 2010, hosted near Winters, CA at the farms of Bruce Rominger (sustainably grown wine grapes) and Russ Lester (organic walnuts).

### **Unequivocal - How climate change will transform California**

California Agriculture (published by UC), April – June 2009 issue  
<http://ucanr.org/repository/CAO/issue.cfm?volume=63&issue=2>

It has in it articles such as:

- How will changes in global climate influence California?
- As carbon dioxide rises, food quality will decline without careful nitrogen management
- Climate change will exacerbate California's insect pest problems
- Modeling shows that alternative soil management can decrease greenhouse gases

### **California Sustainable Winegrowing Alliance**

There are several self-assessment tools for wine grape growers available on the web site of the California Sustainable Winegrowing Alliance, including topics such as:

- Understanding GHG
- Business Case for Climate Protection
- Energy Analysis
- Calculating Carbon
- Market Drivers for Climate Protection
- Taking Action

This is also where CSWA will post their on-line tools to calculate energy efficiency and GHG emissions when they are ready to release them. Go to:  
[http://www.sustainablewinegrowing.org/webresource/18/Climate\\_Protection\\_Resources.html](http://www.sustainablewinegrowing.org/webresource/18/Climate_Protection_Resources.html)

### **International Wine Industry Greenhouse Gas Protocol and Accounting Tool**

The calculator has been developed to incorporate all aspects of Greenhouse Gas emissions from the wine industry as identified by the Wine Industry Protocol. The calculator and Protocol are still considered to be

in the development phase. Vineyards can make calculations on many activities including fuel quantity, stationary combustion, winemaking practices, biomass photosynthesis, vineyard practices and more.  
<http://www.wineinstitute.org/ghgprotocol>

### **National Sustainable Agriculture Information Service (ATTRA/NCAT)**

NCAT has a good publication on climate change and agriculture that covers these topics:

- Climate change science
- How does climate change influence agriculture?
- How does agriculture influence climate change?
- Agriculture's role in mitigating climate change
- The value of soil carbon: Potential benefits for agriculture
- Cap and trade: A private market for greenhouse gas emissions
- Subsidizing positive behavior

It is available to download at:  
<http://www.ncat.org/climate.php>

### **National Sustainable Agriculture Coalition (NSAC) Policy Paper**

This NSAC paper provides recommendations on policies and programs that can mitigate the impacts of rapid climate change in agriculture and reduce overall GHG emissions from agriculture. It gives a relatively current overview of the science regarding climate change and agriculture on a national scale.

The paper can be downloaded at:  
<http://sustainableagriculture.net/publications/>

### **Keyline or Yeoman's Plough**

Keyline is a comprehensive whole farm water management plan that uses natural landscape contours and cultivation techniques to harvest rainwater and build soil fertility. The central idea behind keyline design from a water perspective is to capture water at the highest possible elevation and comb it outward toward the ridges using gravitational

forces, reversing the natural concentration of water in valleys. Maximizing the flow of water to the drier ridges using precise plow lines falling slightly off-contour slows the movement of water and spreads it more uniformly, infiltrating it across the broadest possible area.

For more information on this and other water conservation ideas, see the web site of the California Agricultural Water Stewardship Initiative (CAWSI): <http://agwaterstewards.org/txp/Resource-Center-Articles/21/keyline-design>

### **Enhancing Biodiversity and Multifunctionality of an Organic Farmscape in California's Central Valley**

This was a study done on Rominger's tomatoes showing a relationship between habitat restoration and climate benefits, biodiversity. Habitats with woody vegetation stored 20% of the farmscape's total carbon (C), despite their relatively small size (only 5% of the total farm). Two years of monitoring data of farmscape C and nitrogen (N) through emissions, run-off and leaching showed distinct tradeoffs in function associated with each habitat. Clearly habitat restoration in field margins will increase both landscape biodiversity and the multifunctionality of the farmscape as a whole.

Full paper available at: <http://orgprints.org/12512>

### **Irrigation Efficiency**

The Center for Irrigation Technology at California State University, Fresno has a website with lots of references for irrigation efficiency technology and maintenance:

<http://www.wateright.org/>

### **Nitrogen Cycle**

Here is a very good summary on the nitrogen cycle for the non-specialist:

[http://www.visionlearning.com/library/module\\_viewer.php?mid=98&mcid=&l=](http://www.visionlearning.com/library/module_viewer.php?mid=98&mcid=&l=)

Specific to California, see ARB's page on research projects on GHG emissions from N fertilization:

<http://www.arb.ca.gov/ag/fertilizer/fertilizer.htm#whatsnew>

A recent (2009) and very comprehensive review paper on crop GHG emissions and fertilizer management: Snyder, CS, TW Bruulsema, TL Jensen and PE Fixen. 2009. Review of greenhouse gas emissions from crop production systems and fertilizer management effects.

Agriculture, Ecosystems and Environment 133 (2009) 247–266. This article is available by purchasing it at: [http://www.sciencedirect.com/science?\\_ob=ArticleURL&udi=B6T3Y-4WF8S01-1&user=1928924&coverDate=10%2F31%2F2009&rdoc=1&fmt=high&orig=search&sort=d&docancor=&view=c&searchStrId=1313673594&rerunOrigin=scholar.google&acct=C000055388&version=1&urlVersion=0&userid=1928924&md5=dbd706f8e4affa67010b31999678a189](http://www.sciencedirect.com/science?_ob=ArticleURL&udi=B6T3Y-4WF8S01-1&user=1928924&coverDate=10%2F31%2F2009&rdoc=1&fmt=high&orig=search&sort=d&docancor=&view=c&searchStrId=1313673594&rerunOrigin=scholar.google&acct=C000055388&version=1&urlVersion=0&userid=1928924&md5=dbd706f8e4affa67010b31999678a189)

It can also be obtained at academic libraries and probably from the author: CS Snyder, International Plant Nutrition Institute, [csnyder@ipni.net](mailto:csnyder@ipni.net)

A 2007 version of the same review is available free online on the IPNI site, however the 2009 version is much more comprehensive as it includes numerous recent papers published in 2008:

<http://www.ipni.net/ipniweb/portal.nsf/0/D27FE7F63BC1FCB3852573CA0054F03E>

Another review paper: Sources of nitrous oxide in soils, Bremner, J. M. Nutrient Cycling In Agroecosystems. 1997, VOL 49; 1/3, pages 7-16

### **Link Between Carbon and Nitrogen Cycles**

The C and N cycles are linked and should not be considered separately in agriculture. There is some evidence that increasing a soil's organic matter content (C sequestration) is likely to increase its N<sub>2</sub>O emissions, possibly to the point of negating any of the C sequestration benefit in terms of climate mitigation (at least in the first 10 to 20 years).

See for instance:

a) Carbon Sequestration in Arable Soils is Likely to Increase Nitrous Oxide Emissions, Offsetting Reductions in Climate Radiative Forcing. 2005. Changsheng Li, Steve Frolking and Klaus Butterbach-Bahl. <http://www.springerlink.com/content/p520t3j784v780j2/>

b) The potential to mitigate global warming with no-tillage management is only realized when practised in the long term. 2004. Six, J., S.M. Ogle, F.J. Breidt, R.T. Conant, A.R. Mosier, and K. Paustian. Available on Johan Six website: <http://www.plantsciences.ucdavis.edu/Agroecology/staff/jwsix/publications.html>