

## Soil Fumigant Alternative Projects Funded by DPR

November 2014

### ***Problem Assessment and Priority Setting***

<b>Project title</b>	<b>Organization, PI, location</b>	<b>Dates</b>	<b>Award amount</b>
1. Nonfumigant Strawberry Production Working Group	DPR, Brian Leahy, Director	2011-2013	\$28,350
<p>The Department of Pesticide Regulation (DPR) convened a diverse working group of scientists and other specialists to develop an action plan to accelerate the development of management tools and practices to control soilborne pests in strawberry fields without soil fumigants. The 10-member working group was charged with recommending research priorities for maintaining the viability of the state's \$2.4 billion strawberry industry in the face of increasing restrictions on fumigant use and the phase-out of the fumigant methyl bromide.</p>			
2. Soil Health Symposium	UC Davis (Entomology), Ed Lewis, statewide	2013-2014	\$55,667
<p>DPR, together with UC Davis, CDFA, USDA NRCS, and CalEPA, conducted a 1-day symposium highlighting the current state of knowledge and research needs associated with impacts of fumigants and alternatives on soil biology in CA production agriculture. The symposium was held June 17, 2014. A white paper will be completed to summarize the findings and future priorities as described by participants.</p>			

### ***Pest Management Research Grant Projects***

<b>Project title</b>	<b>Organization, PI, location</b>	<b>Dates</b>	<b>Award amount</b>
1. Reducing Dependence on Pre-Plant Soil Fumigation in Almond and Stone Fruit Orchards	USDA-ARS, Greg Browne, Central Valley	2013-2016	\$130,578
<p>This project aims to eliminate non-essential fumigant usage by 15-50% in almond and stone fruit orchards in the Central Valley. In part this will be accomplished by providing information regarding the action threshold and pest monitoring components of IPM as well as comparing GPS-controlled spot fumigation to conventional strip fumigation.</p>			
2. Methyl Bromide Alternatives for Strawberry Nurseries	UC, Davis, Lynn Epstein, Shasta, Monterey counties	2013-2016	\$153,289
<p>This research aims to examine the efficacy of a number of pesticide and non-pesticide options for a commercial high elevation strawberry nursery. Performance measures include nematode and weed control, yield and quality of nursery plants, and marketable and total fruit yield of the transplants. In addition, the researcher will examine the impact of these treatments on soil quality through N-cycling and soil microbial community analyses.</p>			

3. Integrated Pesticide Reduction Strategies for Insect and Disease Management in Cole Crops	UC Santa Cruz, Carol Shennan, San Mateo, Santa Cruz, Monterey counties	2013-2016	\$399,304
<p>This project explores alternatives to soil fumigant use and OP use on the Central Coast. Three non-fumigant methods of pest and disease management (anaerobic soil disinfestation, mustard meal biofumigation, &amp; rye cover crop incorporation) will be tested in field level studies in Brussels sprouts; and the fundamental IPM practices of monitoring, economic thresholds, plant tolerance at different crop stages, and reduced-risk insecticide application methods will be optimized for cabbage maggot in broccoli.</p>			
4. Improving Efficacy of Biologically Mediated Soilborne Disease Management in Strawberry by the Use of Reduced Rate Fumigations	Dan Legard, California Strawberry Commission	2014-2017	\$298,472
<p>Research on non-fumigant alternatives has not been completely successful in controlling all major soilborne diseases in California strawberry. A strategy that combines the use of fumigants at reduced rates with biologically active soil treatments in sequential combination may produce options that are more effective and significantly reduce the amount of fumigant used to manage soilborne diseases. This project will examine effects of integrating fumigation and biological soil treatments such as anaerobic soil disinfestation (ASD) and mustard seed meal (MSM) on soilborne disease management for strawberry production in California.</p>			
5. Developing a Mobile Steam Applicator to Replace Fumigants for Strawberry	Steve Fennimore, UC Davis, Salinas	2014-2017	\$294,612
<p>Strawberry research indicates that soil disinfestation with steam is an acceptable alternative to soil fumigation. We built a prototype field steam applicator in 2011, and after two years of evaluations have found strawberry yields and pest control similar to fumigation. The 2011 prototype steamer requires water softening- a significant cost and time disadvantage. The prototype steamer, designed for research, requires about 20 hours to treat an acre. Greater steam output, speed and ability to use hard or soft water is needed for commercial-scale steam application. We propose to modify steam generator technology from Precision Combustion (PCI), for use as a field steam applicator. PCI's steam generator requires modification for agricultural use. PCI's compact 10 MM BTU/hr steam generator does not require softened water. A compact commercial-scale steam generator for soil disinfestation in California strawberry fields will be built.</p>			
6. Optimizing Solarization-Based Technologies as Sustainable Alternatives to Soil Fumigation	James Stapleton, University of California	2014-2017	\$299,992
<p>Solarization, with and without organic matter (OM) augmentation, can be an effective and sustainable alternative to soil fumigation with synthetic toxicants under suitable conditions. However, additional tools are needed to address knowledge gaps and to provide comprehensive and reliable decision support to end users. This project will facilitate greater utilization of solarization through:</p> <ol style="list-style-type: none"> <li>1) investigation and refinement of pest management techniques combining solarization and soil OM amendments;</li> <li>2) elucidation of the contributions of microbial activity, community structure, and biochemistry to the solarization process, and</li> <li>3) refinement and validation of our predictive models to enable informed pest management decisions regarding solarization and soil and plant health.</li> </ol>			

7. Determining the Impacts of Plant-Parasitic Nematodes and Soil Fumigation on Pistachio Growth	David Doll, University of California Cooperative Extension Merced County	2014-2017	\$74,384
<p>The necessity of pre-plant fumigation of pistachio trees grown in sandy soils to treat nematode infestations is not known. This study compares soil nematode concentrations, tree growth rates, phenology patterns, and canopy size between plots fumigated with Telone II and non-fumigated plots, as well as the differences among 6 different rootstock lines. If growth is similar among fumigated and non-fumigated plots, then growers could potentially avoid using fumigants and therefore mitigate the costs as well as the environmental, health, and regulatory risks associated with fumigation. If differences between fumigated and non-fumigated plots are observed, further research on proper fumigant use and/or fumigant alternatives would be needed.</p>			
8. Managing Nematode Parasitism and Prunus Replant Disease with Spot Fumigation and Rootstocks	David Doll, University of California Cooperative Extension Merced County	2014-2017	\$108,433
<p>Almond orchard redevelopment is critical to orchard operation sustainability. Properly preparing the soil for new orchard establishment must take into account the presence of plant parasitic nematodes and Prunus Replant Disease (PRD). Soil fumigation has been traditionally used to manage these problems, but the use of fumigants is under scrutiny. This project compares soil nematode concentrations, tree growth, and yield between plots that have been row-stripped or spot fumigated with Telone II C35 and a non-fumigated control. It also compares four rootstocks that will be planted in fumigated and non-fumigated soils. Spot fumigation has been shown to be effective in managing PRD and reducing the amount of fumigant applied, but it is unknown if it is feasible in nematode infested soils. Rootstock selection may provide the potential to manage both nematode parasitism and PRD, which could reduce the need to use fumigants.</p>			

### ***Pest Management Alliance Grant Projects***

<b>Project title</b>	<b>Organization, PI, location</b>	<b>Dates</b>	<b>Contract amount</b>
1. Facilitation of the Anaerobic Soil Disinfestation Pre-Plant Soil Treatment For Strawberry and Caneberry Growers	Farm Fuel, Inc., Stefanie Bourcier, Berry growing regions of California	2013-2016	\$247,850
<p>The primary goals of this project are to promote ASD through 22 demonstration trials, educational outreach events, and literature. The three objectives are: implementation of 22 sites, evaluation of the success of the treatment process through grower questionnaire and interview, and outreach to the grower community through four events, and reports and project summaries available to growers, agricultural professionals, and the media.</p>			

## ***Additional Projects***

<b>Project title</b>	<b>Organization, PI, location</b>	<b>Dates</b>	<b>Contract amount</b>
1. Impact of Soil Fumigant Use in CA and Efficacy of Non-Chemical Alternatives to Soil Fumigation in Key CA Crops	UC Davis, Michael Grieneisen	2013- 2015	\$185,000
<p>This project aims to provide a formal meta-analysis of published literature regarding the efficacy of nonfumigant pre-plant alternatives for a variety of California crops. The project will attempt to identify the best practice alternatives to soil fumigation, potentially setting the stage for future outreach efforts to encourage their adoption by growers. This project will specifically 1) assess the efficacy (based on crop yields) and cost-effectiveness of IPM methods that are alternatives to pre-plant fumigant treatment of soil based on the results of published studies and 2) produce an annotated directory of these IPM methods.</p>			
2. Development and Evaluation of a Raised-Bed Trough Production System to Produce Strawberry Fruit Without the Need for Fumigants	California Strawberry Commission, Dan Legard, Ventura, Santa Barbara, Santa Cruz counties	2011- 2015	\$500,000
<p>This research continues development of a raised-bed soilless substrate method for growing strawberries that will allow strawberry farming without fumigation. Research plots and on-farm trials are being used to evaluate the effectiveness of the method in comparison to conventional production methods.</p>			
			<b>Total:    \$2,775,931</b>