



Kern County Food System Assessment

Indicators for a healthy food and agricultural economy

NOVEMBER 2017 | UNIVERSITY OF CALIFORNIA | SUSTAINABLE AGRICULTURE RESEARCH AND
EDUCATION PROGRAM



Kern County Food System Assessment

**Indicators for a healthy food
and agricultural economy**

**NOVEMBER 2017 | UNIVERSITY OF CALIFORNIA | SUSTAINABLE AGRICULTURE RESEARCH AND
EDUCATION PROGRAM**



UCDAVIS
AGRICULTURAL
SUSTAINABILITY INSTITUTE

University of California
Agriculture and Natural Resources



KAI SER PERMANENT E



Acknowledgements

Project Manager

Gail Feenstra, Ed.D.

Sustainable Agriculture Research and Education Program (SAREP)

Agricultural Sustainability Institute (ASI), UC Davis

Authors

Shosha Capps

Sustainable Agriculture Research and Education Program (SAREP)

Agricultural Sustainability Institute (ASI), UC Davis

Jessica Smith

Sustainable Agriculture Research and Education Program (SAREP)

Agricultural Sustainability Institute (ASI), UC Davis

Gail Feenstra

Sustainable Agriculture Research and Education Program (SAREP)

Agricultural Sustainability Institute (ASI), UC Davis

Edited by

Laura Crothers

Agricultural Sustainability Institute (ASI), UC Davis

Kern Food Policy Council

Morgan Martinez, President Kern Food Policy Council

Jill Egland, United Way of Kern County

Brady Bernhart, Community Action Partnership of Kern

Greg Collins, Community Member

Sheila Kerber, Warren Middle School

Shanta Johnson, EcoCentric Farms

Flor del Hoyo, Kern County Public Health Department

Martin Reynoso, Kern County Department of Aging and Adult Services

Jaclyn Allen, Hen's Roost/Apple Core Project

Dr. Evelyn Young Spath, California State University Bakersfield

Margaret Curran Johns, UC Cooperative Extension Emeritus

Kristin Weber, Kaiser Permanente

Jim Wheeler, Golden Empire Gleaners

Vince Zaragoza, Consultant, GeoPlan Economics

Additional Food System Stakeholders

Brittney Neal-Soberanis, City of Shafter
Beatris Sanders, Kern County Farm Bureau
Craig Murphy, Kern County Planning Department
Dr. Darren Hulbert, Advancing God's Kingdom
Della Hodson, United Way of Kern County
Doris Sons, Kern County Department of Human Services
Gustavo Aguirre, Center for Race, Poverty and the Environment
Kelly Atkinson, Grimmway Academy
Lorna Speight, WIC, Community Action Partnership, Kern County
Sara Luquin, The Wonderful Company
Martha Esparza, Kern County Department of Human Services
Maureen Andrew, California Association of Food Banks
Michael Bower, office of Senator Andy Vidak
Dr. Nyakundi Michieka, California State University Bakersfield
Ralph Martinez, Community Action Partnership, Kern County
Yesenia Ocampo, Dolores Huerta Foundation
Kimberly Johnson, EcoCentric Farms
Amanda Sampson, office of Assemblymember Rudy Salas

We gratefully acknowledge the generous support of United Way of Kern County. Their commitment to building a secure, sustainable food system through diverse community partnerships made this report possible.

Additional funders of this assessment include the Kaiser Permanente Foundation, the Wonderful Company, and Kern Health Systems. The Community Action Partnership of Kern County provided essential input as well as data and mapping expertise to help highlight the geographic locations of resources, services and community needs. Kern County UC Cooperative Extension Advisors provided invaluable input to help frame several of the complex issues in this report, including suggesting data and analyses to illuminate key trends in agriculture and food security. Staff at the Kern County Agricultural Commissioner's Office and the Kern County Farm Bureau generously shared data, perspective, and background context about agricultural trends in the county.

Last but not least, we are grateful to all the growers, distributors, farm workers, agricultural and food businesses, advocates, and other Kern County residents who understand the complexity of the food economy better than we ever will and who are committed to a future that improves the quality, access, health and resilience of the entire food system for years to come.



Table of Contents

Why a Food System Assessment?	2
Collaborators and Process.....	2
Scope of the Assessment.....	3
What is a Food System?	3
Methodology.....	4
Kern County Profile	6
 VISION 1: Healthy, Empowered Food Consumers.....	10
Background and National Trends	10
Kern County Trends.....	11
GOAL 1.1: Kern County students (K-12) have access to nutrition education and hands-on opportunities to learn about the food system.....	13
INDICATOR 1.1.1: Access to school gardens in Kern County	14
MEASURE 1: Number of school gardens in Kern County	14
MEASURE 2: Percentage of Kern County students attending schools with school gardens	15
INDICATOR 1.1.2: Number of Farm to School programs in Kern County.....	16
INDICATOR 1.1.3: Nutrition education activities offered to students in Kern County schools	17
GOAL 1.2: Kern County residents have access to affordable, healthful food at all times that reflects their cultural values.....	20
INDICATOR 1.2.1: Percent of Kern County residents who are food insecure.....	21
INDICATOR 1.2.2: Eligibility and redemption of CalFresh benefits in Kern County.....	26
INDICATOR 1.2.3: Produce distribution and edible waste reduction through Kern County's food recovery and distribution systems.	28
INDICATOR 1.2.4: Walkability to grocery stores.....	29
 VISION 2: Healthy Local Food Economy.....	32
Background and National Trends.....	32
Kern County Trends.....	34
GOAL 2.1: Kern County improves regional economic opportunities for local food producers.	35
INDICATOR 2.1.1: Direct-to-consumer agricultural sales in Kern County.....	36
MEASURE 1: Total dollars of direct-to-consumer agricultural sales	36
MEASURE 2: Number of farms with direct-to-consumer sales in Kern County	38
MEASURE 3: Direct-to-consumer sales as a percentage of total agricultural sales in Kern County...40	40
Direct-to-consumer sales in Kern and Fresno Counties	42
INDICATOR 2.1.2: Number of Farm to School programs in Kern County.....	43
INDICATOR 2.1.3: Number of food hubs and cottage food operators in Kern County.....	44
GOAL 2.2: All Kern County residents have access to local food.....	45
INDICATOR 2.2.1: Acceptance of EBT at farmers markets in Kern County.....	45
INDICATOR 2.2.2: Number of community gardens in Kern County	48

INDICATOR 2.2.3: Public transportation availability near local food markets in Kern County	49
INDICATOR 2.2.4: Local produce donations in Kern County.....	51
GOAL 2.3: The Kern County food system provides job opportunities.....	51
INDICATOR 2.3.1: Average wages in the Kern County food system	51
INDICATOR 2.3.2: Number of jobs in the Kern County food system	56
VISION 3: Healthy Farms and Environment.....	58
Background and National Trends.....	58
GOAL 3.1: The farming sector in Kern County is diverse.....	62
INDICATOR 3.1.1 Crop types in Kern County	63
INDICATOR 3.1.2 Distribution of farm size.....	66
INDICATOR 3.1.3 Average age of farmers.....	69
INDICATOR 3.1.4 Race of principal operator.....	70
INDICATOR 3.1.5 Tenure on farm.....	73
INDICATOR 3.1.6 Percentage of women farm operators	74
INDICATOR 3.1.7. Number of certified organic farms.....	75
GOAL 3.2: Kern County reduces risks associated with pesticide use	79
INDICATOR 3.2.1: Adoption of integrated pest management (IPM) practices	79
MEASURE 1: Use of microbial pesticides.....	80
MEASURE 2: Use of pheromone pest control products.....	82
MEASURE 3: Use of pesticides by estimated risk level.....	84
INDICATOR 3.2.2: Adherence to pesticide use regulations	91
MEASURE 1: Pesticide regulation compliance rates	92
MEASURE 2: Reported pesticide drift incidents	92
MEASURE 3: CDPR enforcement actions related to worker safety.....	94
GOAL 3.3: Kern County's water resources are conserved and support ecosystem health.....	96
INDICATOR 3.3.1 Dissolved nitrate in Kern County water systems	98
MEASURE 1: Dissolved nitrate detected in Kern County surface water.....	98
MEASURE 2: Dissolved nitrate detected in Kern County groundwater.....	99
MEASURE 3: Nitrate maximum contaminant level (MCL) violations in Kern County public drinking water systems	101
INDICATOR 3.3.2 Agricultural water use in Kern County	106
MEASURE 1: Acreage of irrigated agriculture in Kern County.....	107
MEASURE 2: Average water requirements of harvested crops in Kern County.....	109
GOAL 3.4 Kern County's food systems workers are part of a safe and fair work environment.....	112
INDICATOR 3.4.1 Injuries, illnesses, and fatalities among agricultural workers in Kern County	116
MEASURE 1: Occupational accidents reported to OSHA – Support activities for crop production (NAICS 1151).....	117
MEASURE 2: Agricultural pesticide related illnesses reported through the California Pesticide Illness Surveillance Program	119
INDICATOR 3.4.2 Labor law violations among farm labor contractors	120

Observations and Opportunities	122
Vision 1: Healthy, empowered food consumers	122
Goal 1.1: Kern County students (K-12) have access to nutrition education and hands-on opportunities to learn about the food system.....	123
Goal 1.2: Kern County residents have access to affordable, healthful food at all times that reflects their cultural values.....	124
Vision 2: Healthy local food economy	125
Goal 2.1: Kern County improves regional economic opportunities for local food producers	125
Goal 2.2: All Kern County residents have access to local food.....	127
Goal 2.3: The Kern County food system provides job opportunities.....	128
Vision 3: Healthy farms and environment	128
Goal 3.1: Kern County agriculture is diverse	129
Goal 3.2: Kern County reduces risks associated with pesticide use.....	130
Goal 3.3: Kern County's water resources are conserved and promote ecosystem health	131
Goal 3.4: Kern County's food systems workers are part of a safe and fair work environment.....	132
Data Gaps	133
Vision 1: Healthy, empowered food consumers	133
Vision 2: Healthy local food economy	133
Vision 3: Healthy farms and environment	133
Forging Alliances	134
Opportunities	134
Appendices	136
Appendix A: Kern County Schools with Gardens.....	136
Appendix B: Food Systems Job Categories	138
Appendix C: Microbial Pesticides.....	139
Appendix D: Pheromone Pesticides.....	140
Appendix E: Pesticide Risk Categories	141
Appendix F: California Code of Regulations, Pesticides and Pest Control Operations, Agricultural Commissioner Penalties Guidelines	143
Appendix G: Surface Water Monitoring Stations in Kern County	147
Appendix H: Groundwater Sampling in Kern County.....	149
Appendix I: Annual Evapotranspiration Values for California Crops (ETc).....	151
Appendix J: Accidents reported to OSHA for Support Activities for Crop Production (NAICS 1151) in Kern County	153

Why a Food System Assessment?

A food system assessment creates an opportunity for a community to learn more about the connections between production, distribution, consumption, and waste in the food system, and to better understand related economic, environmental, and health trends. Understanding trends and connections within the food system can help community members and policy makers identify successes and challenges, build relationships, and set priorities.

This assessment is the product of collaboration among a broad range of stakeholders across the food system in Kern County, including farmers, retailers, consumers, public health and social service and agriculture professionals, educators, advocates, policymakers, regulators, and more. It is intended to serve as a catalyst for collaborative learning, relationship building, and community-based policy development to strengthen Kern County's food system.

Collaborators and Process

In May of 2015, the Kern Food Policy Council (KFPC) asked the UC Sustainable Agriculture Research and Education Program (UC SAREP) to work with them to conduct a food system assessment in Kern County.

The purpose of this assessment was to collect quantitative trend data that would help the KFPC better understand current conditions, set priorities, and develop opportunities for partnerships and action. The food system assessment was funded through United Way of Kern County, with contributions from regional agricultural businesses and philanthropists.

Collaborative relationships among stakeholders are at the heart of the Kern Food Policy Council's vision for a thriving local food system. In this regard, the process of collaboratively conceptualizing and developing an assessment has served as a strategic opportunity.

As the first step in the process, the KFPC recruited stakeholders from across the food system to participate in a series of stakeholder meetings. During these meetings, UC SAREP facilitated the collaborative development of food systems visions, goals, and indicators to assess progress toward goals.

A framework using three overarching visions was selected. The visions chosen by the stakeholders included:

- Healthy Empowered Food Consumers
- Healthy Local Food Economy
- Healthy Farms and Environment

As a means of informing these larger visions, the group identified a series of goals, each addressing an important and specific aspect of the vision. To measure progress towards these goals, stakeholders then selected a set of quantitative indicators, for which the UC SAREP team (Smith, Capps and Feenstra) took the lead in collecting data. Participating stakeholders assisted the authors in identifying potential data sources and technical experts to provide context and help with data interpretation.

At the end of the assessment, the UC SAREP team made general observations of trends within and across sectors, and suggested opportunities for new connections, priorities, or partnerships. The KFPC can then move forward in developing strategic partnerships and an action plan.

The assessment was reviewed by multiple groups at various stages. Because of the highly technical information in Vision 3 (Healthy Farms and Environment), UCCE advisors with expertise in pesticide and water use reviewed those sections. An expert in the Western Center for Agricultural Health and

Safety at UC Davis reviewed the section on farmworker health and safety. A subgroup of the Kern Food Policy Council reviewed drafts of each section of the assessment before the entire report was sent out to the larger Kern Food Policy Council for comment and review.

Scope of the Assessment

The goal of this assessment is to deepen community understanding of relationships and trends in Kern County's food system, and to support stakeholders in taking an active role in promoting human, environmental and economic health in the food system. Given this broad goal and the diverse range of stakeholders involved, the scope of investigation was necessarily comprehensive, requiring analysis of a wide range of indicators across all sectors of the food system. The assessment focuses primarily on data gathered at the county level, though county data is often compared to similar data at the state level. In some instances, county data is compared to similar data in neighboring counties, or nationally, in order to provide context.

What is a Food System?

The phrase "food system" is used throughout this report to describe the entire set of processes involved in the production and consumption of food. Included within this definition are many activities and products that the consuming public may never see, including the manufacture and application of farm inputs (fertilizers, pesticides, seeds, for example), the distribution, processing and packaging of food products, and the eventual management of wastes generated along the way. As Figure 1 shows, food system components are dynamic and interact with one another. They are also impacted by and influence larger processes, including economic structures, agricultural policies, and community and cultural relationships. The state of a food system is constantly changing, which is why this report uses trends (rather than static points in time) whenever possible to describe the food system.

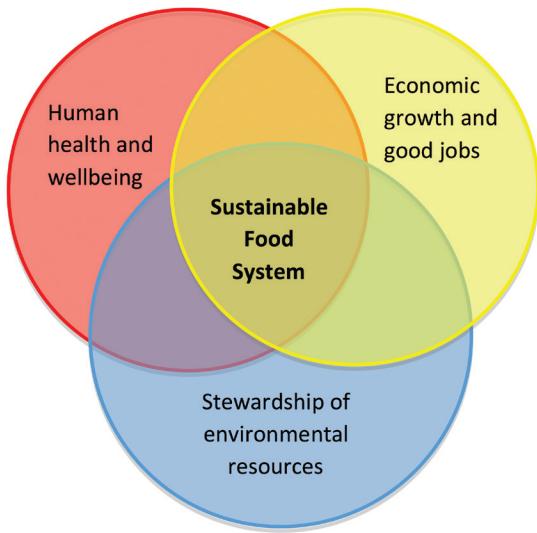
Figure 1. A Food System Framework

*Source: Developed by: The Community and Regional Food Systems Project, University of Wisconsin-Madison. 6/2013.
www.community-food.org.*



Figure 2: A Sustainable Food System

Source: UC Sustainable Agriculture Research and Education Program



This assessment uses the term “sustainable food system.” A sustainable food system in this context is one that integrates sustainable food production, processing, distribution, consumption and waste management in order to enhance environmental, economic and human health. Farmers, consumers and communities all contribute to a sustainable food system.

Aspects of a sustainable food system may include:

- Farms that are economically, environmentally, and socially sustainable
 - Marketing and processing practices that create opportunities for a range of food systems businesses to succeed, supporting local economies and increasing consumer choice
-
- Access to an adequate, affordable, nutritious diet by all community members
 - Food and agriculture-related businesses that create good jobs
 - Food and agriculture policies that promote sustainable food production, processing and consumption
 - Adoption of dietary behaviors that reflect concern about individual, environmental and community health

Methodology

Multiple methods were used to gather data for this report. First, a participatory process was used in which Kern County stakeholders identified visions, goals and potential indicators related to Kern County’s food system.

The UC SAREP team used numerous studies from a growing body of work on food system assessments to assist in indicator identification and data sourcing. The UC SAREP team then did the primary data gathering and developed graphs depicting trends over time. After compiling and organizing data for each indicator, phone and in-person interviews were conducted with Kern food system stakeholders and technical experts to assist in contextualizing and analyzing the trends.

Finally, site visits were conducted to provide an in-depth look at noteworthy programs or processes within the Kern County related to selected goals and indicators.

Major state and national level data sources used in this report include:

- The U.S. Department of Agriculture (USDA)’s National Agricultural Statistics Service (NASS), which conducts a Census of Agriculture every five years that generates national, state and county level data on numerous topics of value to this study
- The University of California, Los Angeles’s California Health Interview Survey (CHIS)
- The U.S. Census Bureau’s Current Population Survey Food Security Supplement (CPS-FSS) and American Community Survey (ACS)
- The California Department of Public Health (CDPH)



Aerial view of Highway 99, Kern County.

PHOTO CREDIT: GREG IGOR

- The U.S. Bureau of Labor Statistics, including the National Agricultural Workers Survey (NAWS) and enforcement data for the U.S. Department of Labor's Occupational Safety and Health Administration (OSHA) and Wage and Hour Division (WHD)
- The California Department of Pesticide Regulation (CDPR)'s pesticide use reports (PUR)
- The U.S. and California Environmental Protection Agencies (EPA and CalEPA)
- The California Office of Environmental Health Hazard Assessment (OEHHA)
- The California State Water Resources Control Board
- The U.S. Geological Survey (USGS)
- The California Pesticide Illness Query (CalPIQ)

On the local level, data sources included:

- The Kern County Ag Commissioner's Office, which prepares annual Kern County Crop Reports, maintains county enforcement records related to pesticide regulation compliance, and provided guidance and interpretation regarding Kern County-specific data
- The Kern County Department of Public Health
- UC Cooperative Extension advisors based in Kern County

The authors of this report recognize that all data sources have limitations, and have taken care to note any of those limitations necessary for accurate interpretation of data. Limitations specific to a particular data source will be included along with the citation or in a footnote on the same page, while broader limitations and context (i.e. data collection methods) can be found in the appendices at the conclusion of the report. In some cases, the data necessary to most effectively measure progress toward the goals identified by stakeholders were not available. In these cases, indicators were either modified to match the best available proxy data or, in some cases, eliminated.

The next section contains a general overview of Kern County to help provide the broader context within which the food system is situated.

Kern County Profile

Size and Climate:

Kern County covers 8,132 square miles (5,204,428 acres).¹ It is the third largest county in California.²

Kern County extends east beyond the southern slope of the Eastern Sierra Nevada range into the Mojave Desert, west across the floor of the San Joaquin Valley to the eastern edge of the Coastal Range, and to the south over the ridge of the Tehachapi Mountains.³

Kern County's climate is generally described as Mediterranean, including wet winters and hot dry summers. Temperatures range from average lows of 31°F in January to average highs of 97°F in July. Average annual precipitation is around 6 inches,⁴ though it varies both year to year and in different parts of the county.



Courtesy of Community Action Partnership of Kern, Brady Bernhart, AICP.

-
- 1 U.S Census Bureau. (2014). State and County Quick Facts: Kern County, 2014 Population Estimates Program. Retrieved October 22, 2015, from <https://www.census.gov/quickfacts/fact/table/kerncountycalifornia/PST045216>
 - 2 Kern County Board of Trade. (2015). About Kern County. Retrieved October 22, 2015, from <http://www.visitkern.com/about/>
 - 3 Key to the City. (2011). Kern County CA Index. Retrieved October 22, 2015, from <http://www.usacitiesonline.com/cakerncounty.htm#communities>
 - 4 Kern Economic Development Corporation. Climate. Retrieved February 28, 2017, from <http://kedc.com/quality-of-life/climate/>

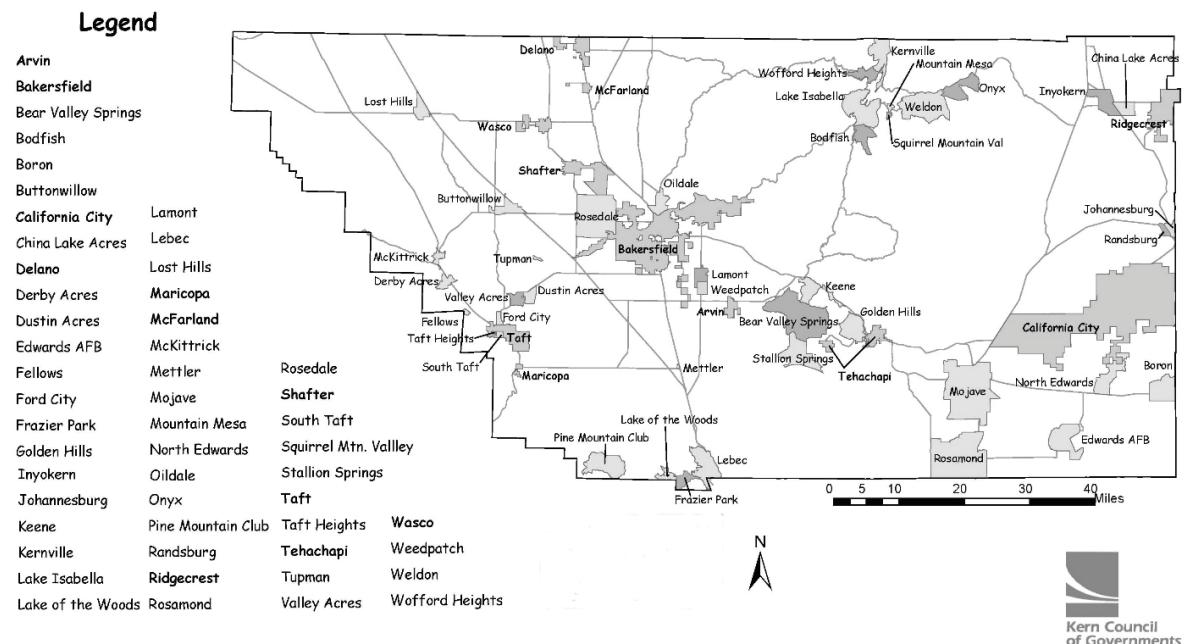
Population, Density and Demographics

The population of Kern County was approximately 882,000 in 2015.⁵ It is the eleventh largest county in California by population.⁶

The population of Kern County grew by 0.7 percent between 2014 and 2015⁷ and is predicted to continue to grow due to a young population, affordable home prices, and growing job opportunities.⁸

Kern County has 11 incorporated cities with the three most populated cities being Bakersfield (population 379,505), followed by Delano (population 52,222), and Ridgecrest (population 28,419).⁹

Kern County Communities Cities and Census Designated Places



5 874,589 in 2014

6 U.S Census Bureau. (2014). State and County Quick Facts: Kern County. 2014 Population Estimates Program. Retrieved October 22, 2015, from <https://www.census.gov/quickfacts/fact/table/kerncountycalifornia/PST045216>

7 State of California, Department of Finance. (2015). E-1 Population Estimates for Cities, Counties and the State with Annual Percent Change—January 1, 2014 and 2015. Sacramento, California.

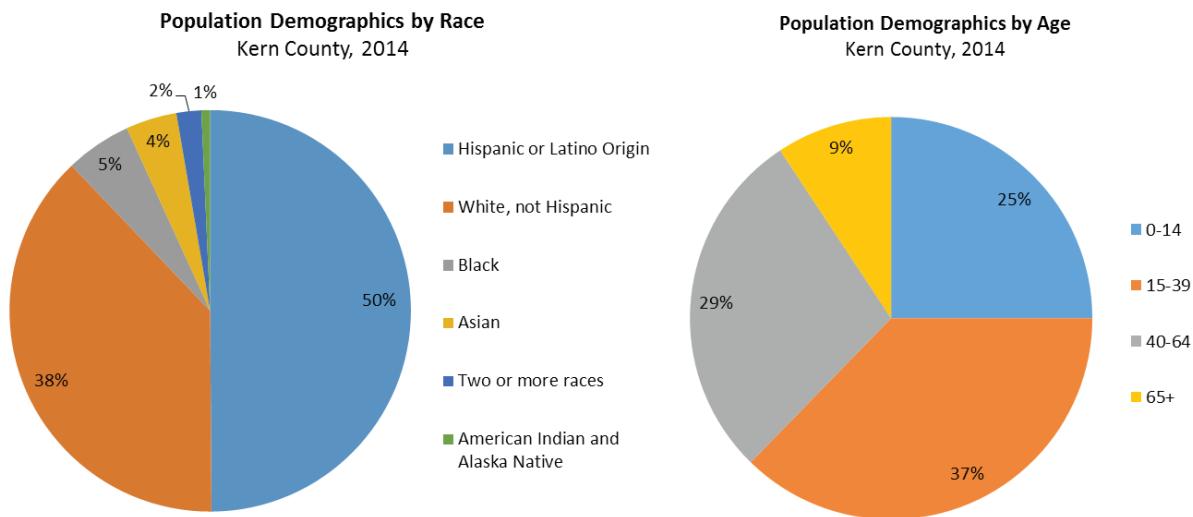
8 Kern Economic Development Corporation. (2015). Kern County Demographics. Retrieved November 4, 2015, from <http://kecd.com/community-profile/demographics/>

9 State of California, Department of Finance. (2015). E-1 Population Estimates for Cities, Counties and the State with Annual Percent Change—January 1, 2014 and 2015. Sacramento, California.

The majority of residents in Kern County are between the ages of 15 and 39, with a median age of 35 (see Figure 3).¹⁰ The principal race in Kern County is Hispanic/Latino (50 percent), followed by White Non-Hispanic (38 percent).¹¹

Figure 3: Kern County population by age and race

Source: Source: U.S. Census Bureau, 2014 American Community Survey



Main Economic Drivers:

Kern County's agriculture sector is the largest economic sector in the county. In 2014, the gross value of all agricultural commodities produced in Kern County was over \$7.5 billion.¹² Grapes, almonds, milk, citrus, and cattle and calves generated more than \$5 billion in revenue. The county's agriculture sector is expanding, with employment growth exceeding most other California counties. Over 20 percent of the county's workforce is employed in this sector.¹³

One of the other main economic drivers is oil. Kern County is the number one oil-producing county in the continental United States.¹⁴

Oil production and agriculture are two of the largest economic sectors in Kern County.

PHOTO CREDIT: SUSAN REEP

10 U.S. Census Bureau. (2014). State and County Quick Facts: Kern County. 2014 American Community Survey. Retrieved February 22, 2016, from <http://www.census.gov/quickfacts/table/RHI825214/06029,001>

11 Ibid.

12 Ibid.

13 Kern Economic Development Corporation. (2015). Value-Added Agriculture. Retrieved November 4, 2015, from <http://kedc.com/site-selection/target-industries/value-added-agriculture/>

14 Kern Economic Development Corporation. (2014). Kern County Takes the Lead for Oil Production. Retrieved November 4, 2015, from <http://kedc.com/kern-county-takes-the-lead-for-oil-production/>



Kern County landscape.

PHOTO CREDIT: DOUG KESSLER

Poverty, unemployment and public benefits:

In Kern County, approximately 22.9 percent of the population lives below the poverty level, compared to 15.9 percent for the state of California.¹⁵

The unemployment rate in Kern County was 10.4 percent in December 2015, compared to 5.9 percent in the state of California for the same period.^{16 17}

About 22.7 percent of the total population in Kern County receives food stamps, compared to 18.1 percent in the state of California.¹⁸

The percentage of low income individuals (at or below 200 percent of the Federal Poverty Level) experiencing food insecurity in Kern County in 2014 was 30.4 percent.¹⁹

¹⁵ U.S. Census Bureau. (2013). State and County Quick Facts: Kern County. 2013 American Community Survey. Retrieved October 22, 2015, from http://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml

¹⁶ California Employment Development Department. Historical data for unemployment rate and labor force (not seasonally adjusted) in Kern County; also, California Economic Indicators: California seasonally adjusted labor force, unemployment rate, and labor force participation rate.

¹⁷ As of January 2017, the unemployment rate has risen to 11.1% in Kern County and decreased to 5.5% in California.

¹⁸ California Health Interview Survey, UCLA. (2014). http://ask.chis.ucla.edu/AskCHIS/tools/_layouts/AskChisTool/home.aspx#/results

¹⁹ Ibid.



VISION 1: Healthy, Empowered Food Consumers

Background and National Trends

Healthy human communities depend on a healthy food system, including food production, processing, preparation, consumption, and waste management. A healthy food system is one that is economically, ecologically, and socially sustainable, and that provides all people access to safe, affordable, nutritious, culturally appropriate food at all times.

Despite dependence on the food system, many Americans are no longer aware of where their food comes from or how their choices may impact the food system. Increased urbanization and globalization in the food system likely contribute to this lack of awareness by increasing the distance between consumers and producers.¹

Lack of knowledge about food systems and nutrition, combined with people's increasingly sedentary lifestyles, contributes to growing rates of diet-related health problems in many communities. Currently, more than one third of Americans are overweight or obese,² with only about 30 percent consuming recommended amounts of fruits and vegetables,³ putting these Americans at greater risk of heart disease, high blood pressure, and stroke.⁴

According to the U.S. Centers for Disease Control (CDC), encouraging a better understanding of the origins of food and the benefits of healthy eating, combined with increased access to fresh fruits and vegetables, can help stem the tide of diet-related disease.⁵

The CDC also recommends food policy councils as one way to improve the food environment at state and local levels, stating that:

"Food policy councils and other types of food councils provide support and advise residents and

-
- 1 Phoenix, L.E. (2009). Introduction to Volume 1. In L.E. Phoenix (Ed.), *Critical Food Issues: Problems and State-of-the-Art Solutions Worldwide* (xiii-xx). Santa Barbara, CA: Praeger.
 - 2 Ogden, C. L., Carroll, M. D., Kit, B. K., & Flegal, K. M. (2014). Prevalence of childhood and adult obesity in the United States, 2011-2012. *JAMA*, 311(8), 806-814.
 - 3 Casagrande, S. S., Wang, Y., Anderson, C., & Gary, T. L. (2007). Have Americans increased their fruit and vegetable intake?: The trends between 1988 and 2002. *American Journal of Preventive Medicine*, 32(4), 257-263.
 - 4 Van Duyn, M. A. S., & Pivonka, E. (2000). Overview of the health benefits of fruit and vegetable consumption for the dietetics professional: selected literature. *Journal of the American Dietetic Association*, 100(12), 1511-1521.
 - 5 Centers for Disease Control and Prevention. (2011). Strategies to prevent obesity and other chronic diseases: The CDC guide to strategies to increase the consumption of fruits and vegetables. Atlanta: Centers for Disease Control and Prevention, US Dept of Health and Human Services.



Orange trees, Kern County.

PHOTO CREDIT: SUSAN REEP

governments on how to develop policies and programs to improve local food systems. The goal is to increase access to and the availability of affordable, healthy foods such as fruits and vegetables.”⁶

The goals and indicators in Vision 1 generate a picture of how Kern County residents may move closer to becoming healthier, more empowered food consumers.

Kern County Trends

Education about nutrition and the food system more generally is a foundation upon which healthful food choices are made. Providing opportunities for K-12 students to learn about the food system and nutrition in classrooms, and through experiential learning in gardens, on farm tours and in school cafeterias can collectively make positive health impacts.⁷ Approximately 14 percent of Kern County public schools in the 2014–15 school year have school gardens (in about one third of all school districts), most clustered in and around Bakersfield. About 12 percent of all students are enrolled in schools with school gardens. Not all students might participate, but they are likely aware of their school gardens. In the 2013–14 school year, eight school districts (17 percent of all districts) reported some “farm-to-school” activity in which schools sourced food from local farms for their school cafeterias, engaged students in farm tours and/or school gardens, and/or integrated food, nutrition or agriculture in curricula. Of the six school districts that reported local purchasing, 31 percent of their food budgets were spent locally.

Nutrition education is often conducted with students through the Expanded Food and Nutrition Education Program (EFNEP), coordinated by UC Cooperative Extension staff and volunteer educators. The number of volunteer teachers and students reached has varied quite a bit over the last decade, from a low of 138 teacher volunteers (2012) and 3,955 students (2014) to a high of 406 volunteers (2014) and 10,626 students (2007).

⁶ Ibid.

⁷ Scherr, R.E., Dharmar, M., Linnell, J., Dharmar, M., Beccarelli, L.M., Bergman, J.J., Briggs, M., Brian, K., Feenstra, G., Hillhouse, J.C., Keen, C.L., Ontai, L.L., Schaefer, S.E., Smith, M.H., Spezzano, T., Steinberg, F.M., Sutter, C., Young, H.M., & Zidenberg-Cherr, S. (2017). A multi-component, school-based intervention, the *Shaping Healthy Choices Program*, improves nutrition-related outcomes. *Journal of Nutrition Education and Behavior*.

PHOTO CREDIT: SHOSHA CAPP'S



Community garden in Arvin, Kern County.

Another important element of becoming healthy, engaged food consumers is having access to nutritious, affordable food. Between 30 percent and 55 percent of Kern County residents at or below 200% of the Federal Poverty Level (FPL) are food insecure. Food insecurity rates in Kern County generally exceeded rates for California over the last decade except in a couple of years (2009 and 2014). Notably, in 2014, as a result of the drought emergency declared by Governor Jerry Brown, up to \$25 million was provided to California counties most impacted by the drought, including Kern County. In Kern County, this Drought Food Assistance Program provided food boxes to food banks, which were distributed by the Community Action Partnership of Kern (CAPK). Food insecurity among Kern County residents earning at or below 200% of the FPL subsequently dropped in 2014 to the

lowest level (30 percent) in ten years, although the percentage of individuals with incomes below the Federal Poverty Level remained high (approximately 25 percent).

About 16–18 percent of Kern County residents receive CalFresh benefits, which is about five to eight percentage points higher than California as a whole. California has the lowest participation rate for SNAP/CalFresh among working families compared to any state in the U.S. and is tied for lowest overall participation. In Kern County, about 35 percent of households that are eligible for CalFresh are not receiving it.

The emergency food system (food banks, pantries, gleaning programs, faith-based organizations and the like) has two purposes: (1) serving as a safety net to provide food to people experiencing food insecurity who may or may not receive assistance from government food programs and (2) serving to reduce edible food waste from farms and retail outlets through food recovery and distribution. In Kern County, three organizations account for the majority of emergency food distribution: The Garden Project, The Community Action Partnership of Kern (CAPK), and Golden Empire Gleaners. Pounds of food distributed or gleaned have increased steadily from 2012 to 2015 for CAPK Food Bank (more than 13 million pounds in 2015) and the Garden Project (almost 20,000 pounds in 2015). The Golden Empire Gleaners distributed less in 2014 than in 2015, although 1.7 million pounds were distributed in 2015.

The same data can also be used to show how much food recovery and distribution has occurred in Kern County.

Maps are a highly effective tool for juxtaposing food availability (stores, farmers markets) and areas of high poverty in the county. In these high poverty areas, low-income residents are less likely to own a vehicle and thus would find it much more difficult to get to a grocery store if one were not nearby. CAPK's GIS map highlights where these areas are throughout the Bakersfield area; there are some areas in the Central Bakersfield area and some south of Bakersfield that need attention.

GOAL 1.1:

Kern County students (K-12) have access to nutrition education and hands-on opportunities to learn about the food system.

Background

One way to increase public understanding and engagement with the food system is to provide educational opportunities for children and youth to learn how food is grown and prepared. Children that are exposed to healthy foods are more likely to make healthy eating choices throughout their lives.⁸

One of the most common strategies to encourage healthy eating for young children is through Farm to School programs, which may include nutrition education, school gardens, and the purchasing of local foods for school meals.

EDIBLE SCHOOLYARD KERN COUNTY: A program of the Grimm Family Education Foundation

The Edible Schoolyard Kern County (ESYKC) provides hands-on garden and kitchen education to students in Kern County. The goal is to encourage children in their discovery and development of a healthy relationship with the food they eat. The ESYKC is a signature program of the Grimm Family Education Foundation, whose mission is to close the achievement gap, graduating students at or above grade level in literacy and math, and improve the health of students and families.

The Grimm Family Education Foundation hosts two Edible Schoolyard locations in Kern County. Founded in 2010, the Buena Vista Edible Schoolyard in Bakersfield works in collaboration with the Panama Buena Vista Union School District, serving 1,000 students in Kindergarten through 6th grade. Grimmway Academy Edible Schoolyard, founded in 2012, is located in Arvin on the campus of Grimmway Academy, and serves 776 students in Kindergarten through 8th grade.

Each Edible Schoolyard site has a learning kitchen and a one-acre garden. Students come to the kitchen and garden classrooms a minimum of 16 times per year. The ESYKC holds Family Cooking Classes and Family Garden Days throughout the year for students and their families. Seasonal Markets, an Annual Plant Sale and Summer Camps are offered to the community throughout the year as well.

The Program will be expanding to Shafter, California in the 2017–2018 school year, providing edible education to a new community of families and students.



Edible Schoolyard learning kitchen.

PHOTO CREDIT: GRIMMWAY FAMILY EDUCATION FOUNDATION

⁸ Blanchette, L., & Brug, J. (2005). Determinants of fruit and vegetable consumption among 6–12-year-old children and effective interventions to increase consumption. *Journal of Human Nutrition and Dietetics*, 18(6), 431–443.

INDICATOR 1.1.1: Access to school gardens in Kern County

Background

School gardens connect children and youth to the natural world and provide a hands-on space where they can learn about where food comes from and how it is grown. School gardens may increase students' access to fresh fruits and vegetables, and can encourage healthier eating patterns because students are more likely to eat foods that are familiar to them.⁹ In addition to increasing food literacy and contributing to the physical health of students, school gardens have also been shown to promote academic achievement in a variety of subjects and to improve social and behavioral well-being.¹⁰ Attitudes toward food choices develop early in childhood and influence eating habits and health throughout the lifespan.¹¹ Additionally, research shows that students at schools that incorporate hands-on gardening into their curriculum demonstrate more concern for and willingness to care for living things.^{12,13}

For the purpose of this assessment, the definition of a school garden is adapted from Creating and Sustaining Your School Garden (CSYSG), a curriculum developed by the Western Growers Foundation and used by UC Cooperative Extension in Kern County.¹⁴

According to CSYSG, a school garden can take many shapes and forms—from a few tubs filled with potting soil, to a set of raised beds, to more traditional garden rows. One thing all school gardens have in common is that they grow plants (fruits and vegetables) that students have the opportunity to eat. School gardens may be available to all students or to just students that participate in a specific program.

MEASURE 1: Number of school gardens in Kern County

Background

The school gardens included here are those that partner with UC Cooperative Extension in Kern County to implement the CSYSG curriculum.¹⁵ Any school in any district can choose to participate in a CSYSG workshop for a small fee. The workshop covers planning and designing a school garden, basic garden skills, curriculum connections, and outdoor classroom management. Participating districts receive the full CSYSG curriculum as well as follow-ups with a school garden specialist who can also be hired to help get gardens started.

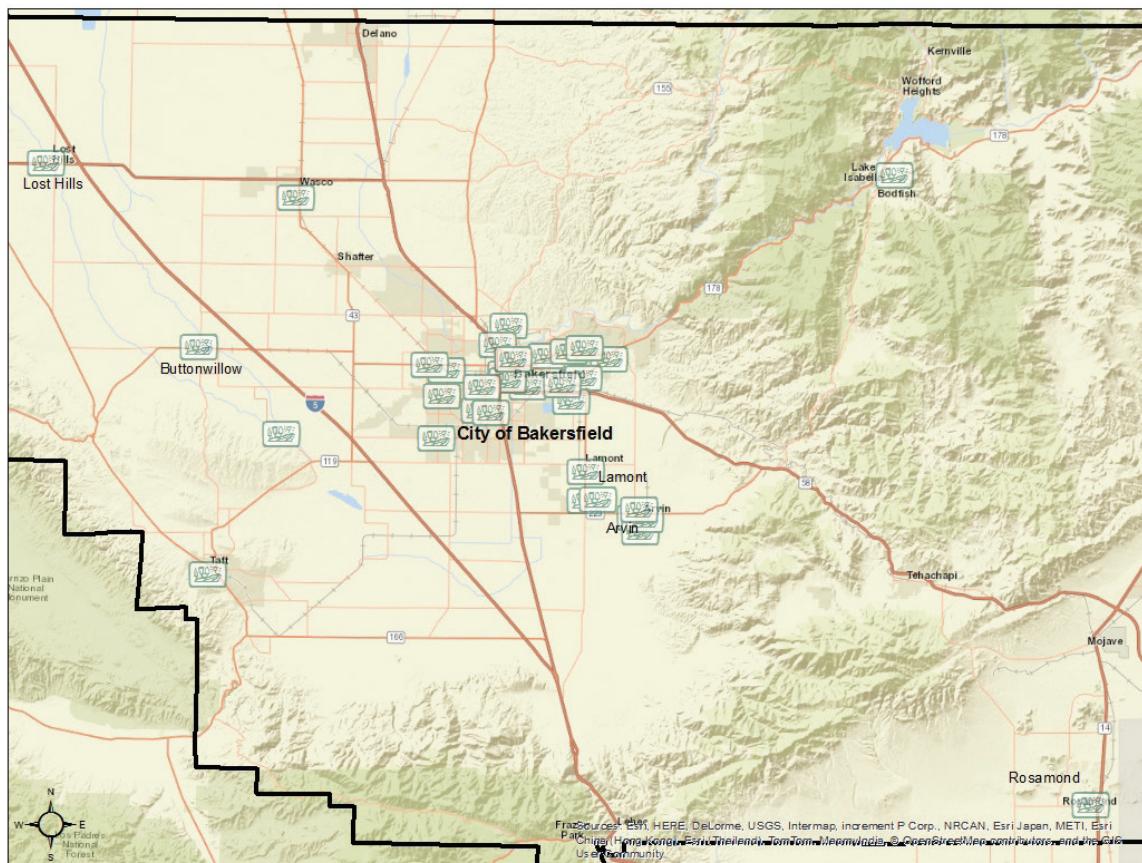
Kern County Trends

In Kern County, there are currently 34 schools (out of a total of 265 schools countywide, about 14 percent of all schools) with a school garden that participates in the CSYSG curriculum. These 34 different schools are located within 17 (out of 47) school districts across the county (36 percent of districts). Figure 1 shows the location of these school gardens in Kern County, most of which are located in the Bakersfield area.

-
- 9 Robinson-O'Brien, R., Story, M., & Heim, S. (2009). Impact of garden-based youth nutrition intervention programs: a review. *Journal of the American Dietetic Association*, 109(2), 273–280.
- 10 The Collective School Garden Network. (n.d.). Retrieved October 20, 2016, from <http://www.csgn.org/>
- 11 Adamo, K. and Brett, K. (2013). Parental perceptions and childhood dietary quality. *Maternal Child Health J*, 18(4). Published online: DOI 10.1007/s10995-013-1326-6.
- 12 Eames-Sheavly, M. (1994). Exploring horticulture in human culture: An interdisciplinary approach to youth education. *HortTechnology*, 4(1), 77–80.
- 13 Murphy, J. M. (2003). Education for sustainability: findings from the evaluation study of The Edible Schoolyard. Berkeley, CA: Centre for Ecoliteracy and The Edible Schoolyard.
- 14 The Collective School Garden Network: Creating and Sustaining Your School Garden. (n.d.). Retrieved January 24, 2017, from <http://www.csgn.org/>
- 15 As of the writing of this report, the only organized and up-to-date information available on school gardens at the county level was based on UC Cooperative Extension records regarding CSYSG workshop participants and follow-up visits. There may be additional school gardens in Kern County that have not participated in this program.

Figure 1. School Gardens in Kern County (2015)

Source: Data provided by University of California Cooperative Extension, Kern County. Map created by Brady Bernhart, Community Action Partnership of Kern.



MEASURE 2: Percentage of Kern County students attending schools with school gardens

Background

In addition to looking at the total number of gardens, school garden access can also be viewed in terms of the percentage of students who attend a school with a garden.

Kern County Trends

Kern County contains 265 public schools in 47 school districts with a total of 180,304 students enrolled during the 2014–15 school year. An additional 2,068 students attended three charter schools, Grimmway Academy,¹⁶ Valley Oaks, and Wonderful College Prep Academy, which also have school gardens (not included in totals in Measure 1). Out of these 182,372 students, 21,391 (12 percent of all students) were enrolled in schools with a school garden in the 2014–15 school year. This includes all students who attended a school with a school garden, regardless of whether they actually came into contact with the garden. Some school gardens may be used primarily for after-school programs, seasonal curriculum, or other kinds of special curriculum that not all students participate in.

Appendix A shows the location and enrollment for each school in Kern County that has a school garden.

¹⁶ As of the May, 2017, Grimmway is enrolling students in a new charter school that will open in Shafter in fall of 2017. This school will also have a school garden.

INDICATOR 1.1.2: Number of Farm to School programs in Kern County

Background

Farm to School programs create connections between local farms and local schools. These programs may involve sourcing locally produced foods for the cafeteria or classroom, taking students on field trips to farms, and/or integrating other food and agriculture topics into K-12 curricula. Farm to School programs are designed to benefit both school children and local farms.

The USDA Farm to School Program, which seeks to improve access to local foods in schools, was formally established by the Healthy, Hunger-Free Kids Act in 2010. In 2013, the USDA conducted the first national Farm to School Census to help establish realistic goals and track progress. A second Farm to School Census was conducted in 2015.

According to the 2015 Farm to School Census, 55 percent of California school districts reported Farm to School activities in the 2013–2014 school year, well above the national average of 42 percent. This represents 373 districts, 5,498 schools, 3,446,240 students, and more than \$167 million invested in local food in California.¹⁷

Kern County Trends

According to the 2015 National Farm to School Census, eight (out of 47) school districts in Kern County participated in Farm to School activities during the 2013–2014 school year. This accounts for 85 schools (out of 265 schools in the county).

Six of these eight districts purchased local food as part of their Farm to School activities. These six districts reported spending an average of 31 percent of their food budget locally.

Table 2 shows the six districts that sourced school food locally in Kern County in 2013–2014 and the way in which each district defined “local.”

Table 2. Kern County school districts that purchased local food in the 2013–2014 school year¹⁸

Source: USDA Farm to School Census

School District	How District Defines “Local”
Arvin Union Elementary	Produced within the state
Bakersfield City	Produced within a 200 mile radius
Beardsley Elementary	Produced within a 100 mile radius
Panama-Buena Vista Union	Produced within the state
South Fork Union	Produced within the same city/county
Taft City	Produced within a 100 mile radius

In addition to the local purchases made by school districts in Kern County, Kern County farms also contribute local food to school districts outside the county. Several other California school districts with Farm to School programs (including districts in Oakland, Los Angeles, Fresno, and Sacramento) use definitions of local that include farms in Kern County (for example “statewide” or “within a 250–300 mile radius”). Because districts outside of Kern County are more likely to be purchasing Kern products through a distributor than directly from a farmer, school food service directors may

¹⁷ USDA Food and Nutrition Service, Farm to School Program. (2016). 2015 Farm to School Census. Retrieved January 26, 2017 from <https://farmtoschoolcensus.fns.usda.gov/home>

¹⁸ Of the eight districts in Kern County that completed the 2015 Farm to School Census, only elementary or middle schools were represented. None of the districts above represent any of the high schools in the county.

not realize that these products (“local mandarins,” for example) come specifically from Kern County. Nonetheless, purchases made through Farm to School programs both inside and outside Kern County have the potential to benefit Kern County farmers.

INDICATOR 1.1.3: Nutrition education activities offered to students in Kern County schools

Background

Students who learn about where their food comes from, how to choose healthy foods, and how to prepare healthy meals have an increased likelihood of maintaining healthier eating habits into adulthood.^{19,20,21}

Communities across the U.S. use a range of methods and curriculums to educate young people about the importance of a healthy diet. One common source of nutrition education is the Expanded Food and Nutrition Education Program (EFNEP). EFNEP is a federally funded program through the United States Department of Agriculture’s National Institute of Food and Agriculture (USDA NIFA). EFNEP offers nutrition education to students in at-risk communities to help youth gain the skills and knowledge to follow nutritionally sound diets. Students learn how to select and identify healthy foods, increase physical activity, and practice safe food handling. Teachers can voluntarily opt in to receive EFNEP, which gives them access to training and allows them to distribute the EFNEP curriculum in their classrooms.²²

Wonderful College Prep Academy

Wonderful College Prep Academy, a public charter school located in Delano, CA, was founded by The Wonderful Company in 2009 to improve educational opportunities for young people across the Central Valley. The Academy currently serves grades 6–12 and will be adding kindergarten through first grade in 2017. The Academy recently received funds from the California Career Pathways Trust to support Ag Prep, a Career Technical Education program that prepares students for high-paying jobs in the technology-driven agriculture industry. Ag Prep is a regional collaborative of seven school districts, three community colleges, The Wonderful Company, Olam International, and Grimmway Farms.

The school used a portion of this funding to create a learning garden so that 6–8 graders have hands-on experiences in science and STEM classes, reinforcing core learning while allowing students to explore subjects and career pathways that they can pursue in high school. Students grow and care for their own plants throughout the year, learning about plant growth cycles and the effects of pH and minerals on plant health. In addition, students learn to take ownership and develop pride in their work. The learning garden also supports the school’s health and wellness initiative by encouraging students to think about their roles in the local food system and to make healthy and sustainable choices.

19 Murphy, J. M. (2003). Education for sustainability: Findings from the evaluation study of The Edible Schoolyard. Berkeley, CA: Centre for Ecoliteracy and The Edible Schoolyard.

20 Joshi, A., Misako Azuma, A., & Feenstra, G. (2008). Do farm-to-school programs make a difference? Findings and future research needs. *Journal of Hunger & Environmental Nutrition* 3:2-3 (2008): 229–246.

21 Lytle, L. A. (1994). Nutrition Education for School-Aged Children: A Review of Research.

22 University of California, Division of Agriculture and Natural Resources. (n.d.). Expanded Food and Nutrition Education Program. Retrieved March 02, 2017, from <http://efnep.ucanr.edu/>

been used in the county since 1995. The program is funded by the USDA NIFA, which has allocated a budget of approximately \$50,000 annually to EFNEP programming in Kern County schools. Kern County schools used to rely on teacher volunteers to adapt and distribute this program in their classrooms. As of summer 2017, EFNEP nutrition educators are not allowed to use teachers as "extenders" of nutrition education, but must provide the information directly.²³ Often, but not always, schools that have gardens use the EFNEP curriculum as a supplement to the gardening program.

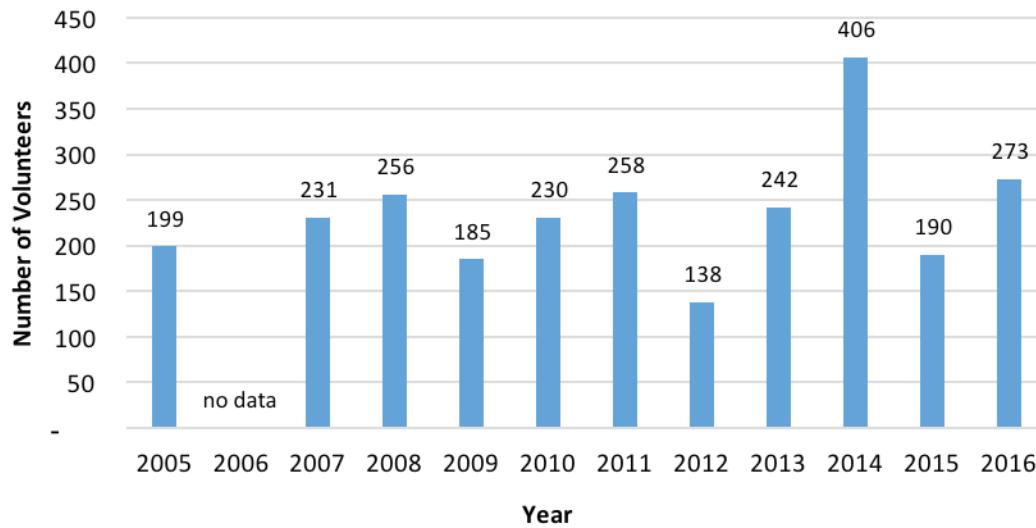
The UC Cooperative Extension office in Kern County maintains records of EFNEP activities, including the number of teacher volunteers using EFNEP and the number of students enrolled in EFNEP.

Figure 2 shows the number of teacher volunteers using EFNEP in Kern County over the last decade.

Figure 2. Number of teacher volunteers using EFNEP in Kern County

Source: Margaret Johns, Nutrition Family Consumer Science Advisor, UC Cooperative Extension (UCCE), emeritus

**Number of Teacher Volunteers using EFNEP Curriculum
Kern County (2005–2016)**



²³ Personal conversation with Katie Panarella, California State EFNEP Office, June 5, 2017.



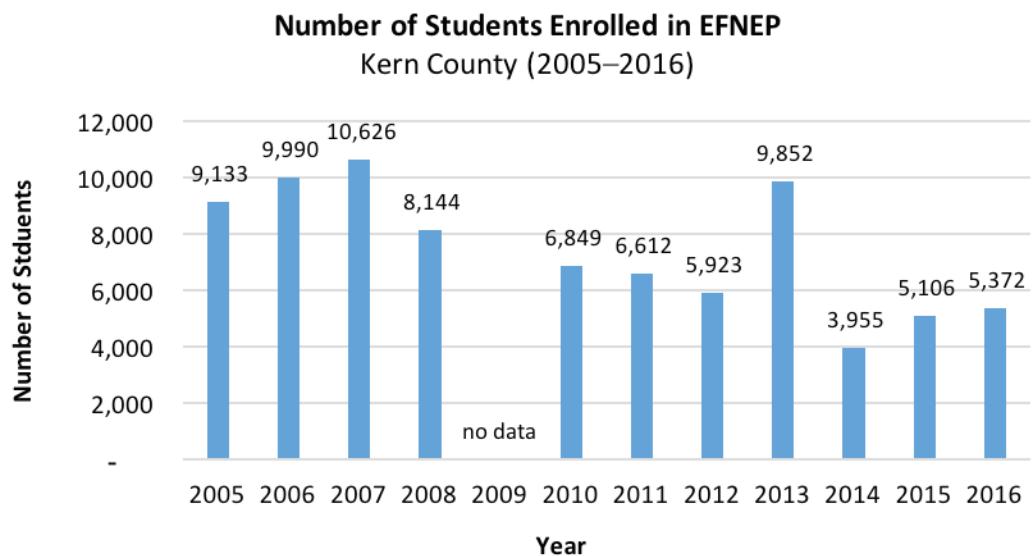
PHOTO CREDIT: GRIMMWAY FAMILY EDUCATION FOUNDATION

Edible Schoolyard garden

Figure 3 shows the number of students enrolled in EFNEP each year over the same time period.

Figure 3. Number of students enrolled in EFNEP in Kern County

Source: Margaret Johns, Nutrition Family Consumer Science Advisor, UC Cooperative Extension (UCCE), emeritus



The number of teacher volunteers has remained stable over the last ten years, while the number of enrolled students has decreased slightly.

In 2016, the number of students enrolled in EFNEP (5,372) represented approximately 3 percent of all students in Kern County.

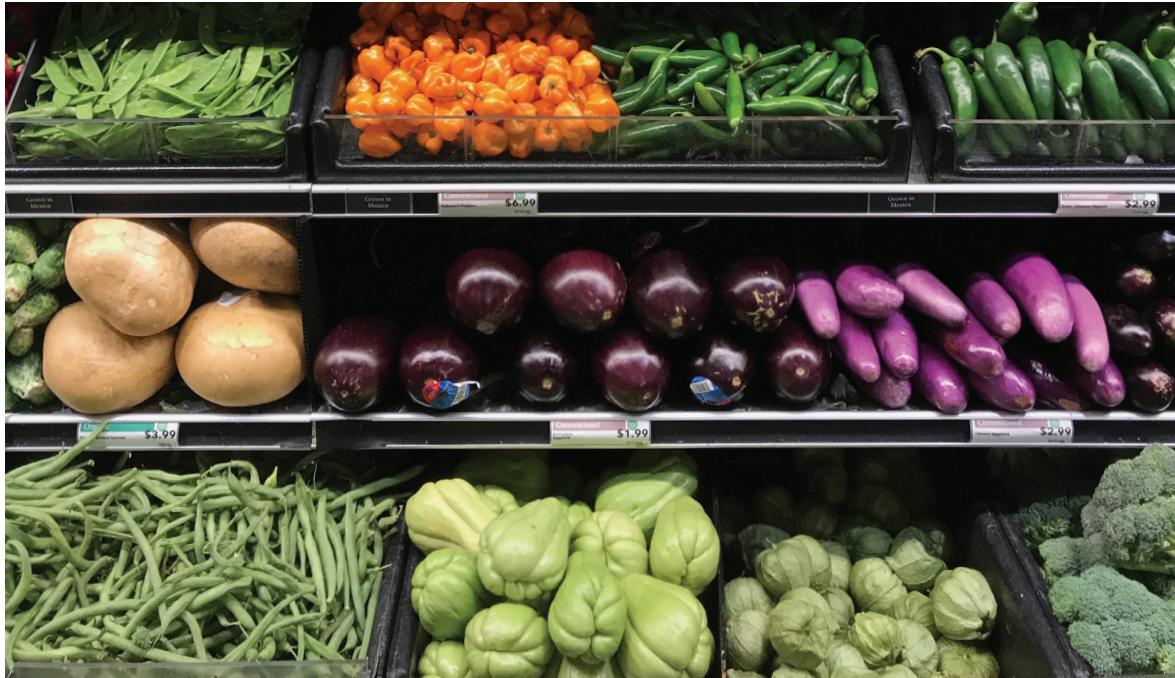


PHOTO CREDIT: SUSAN REEP

Grocery store display, Bakersfield, Kern County.

GOAL 1.2:

Kern County residents have access to affordable, healthful food at all times that reflects their cultural values.

Background

California has been the largest agricultural producer in the U.S. for more than 50 years and leads the country in agricultural exports. However, the state's agricultural abundance does not necessarily translate into affordable access to healthful foods for those who live there.

When adjusted for cost of living, California had the highest poverty rate of any state in the U.S. in 2015 at 20.6 percent (the national average in 2015 was 15.1 percent).²⁴

Between 2003–2005 and 2010–2012, a higher percentage of households reported experiencing food insecurity in California than the national average (11.7 versus 11.4 percent and 15.6 versus 14.7 percent, respectively). However, due to a 3 percent drop in food insecurity in California between 2010–2012 and 2013–2015, California's food insecurity rate is now slightly below the national average (12.6 versus 13.7 percent), though still above pre-recession levels.²⁵

A disconnect between agricultural productivity and food security can also be seen at the county level. Some of the most agriculturally productive counties in California, including Fresno, Kern, and Tulare, also have some of the highest rates of food insecurity.²⁶

24 Renwick, T., & L. Fox. (2016). The Supplemental Poverty Measure: 2015; U.S. Census Bureau; PG60-258 (RV); September 2016. Retrieved February 23, 2017 from: <http://www.census.gov/content/dam/Census/library/publications/2016/demo/p60-258.pdf>

25 Coleman-Jensen, A., Rabbit, M., Gregory, C., & Singh, A. (2016). Household Food Security in the United States in 2015; Economic Research Report No. (ERR-215) September 2016; Retrieved November 1, 2017 from <https://www.ers.usda.gov/publications/pub-details/?pubid=79760>

26 Jessup, E. (2011). Working for a fair and healthy food system in the Central Valley. Central California Regional Obesity Prevention Program (CCROPP), Central California Center for Health and Human Services at California State University, Fresno.

INDICATOR 1.2.1: Percent of Kern County residents who are food insecure.

Background

According to the U.S. Department of Agriculture, food insecurity is defined as "a household-level economic and social condition of limited or uncertain access to adequate food."²⁷ Most households in the U.S. are food secure. The USDA Economic Research Service (ERS) collects and publishes national and state level food security data.

According to ERS data, approximately 12.7 percent of U.S. households were food insecure in 2015, down from 14 percent in 2014 and continuing a downward trend from a high of 14.9 percent in 2011. Among food insecure households in 2015, 59 percent reported that in the previous month they had utilized at least one of the three largest federal food and nutrition assistance programs (SNAP, WIC, or the National School Lunch Program).²⁸

The California Health Interview Survey (CHIS) collects and publishes food insecurity data for individual counties in California. However, CHIS uses a different data collection method from the ERS and food security levels from these two sources cannot be compared.

Whereas the national ERS figures for food insecurity include all households regardless of income level, the CHIS is only distributed to individuals with incomes at or below 200 percent of the Federal Poverty Level (FPL). The FPL in 2014 was \$11,670 for an individual and \$23,850 for a 4-person household.²⁹ In Kern County, approximately 25 percent of individuals fell below the FPL in 2014,³⁰ higher than the state rate of 17 percent. Only those individuals with incomes at or below 200 percent of the FPL are included in CHIS data, which is used throughout this section, unless otherwise noted.

Kern County Trends

Kern County's climate allows for food to be grown year-round and ranks among the top five most agriculturally productive counties in the United States.³¹ However, many Kern County residents struggle to feed their families. A 2015 survey of food hardship³² in the U.S. found Bakersfield to be the least food secure metropolitan area in the U.S., with 24.2 percent of respondents reporting difficulties feeding themselves or their families.³³ The Community Action Partnership of Kern did a comprehensive review of hunger and food insecurity in Kern County in 2014, highlighting hunger trends and statistics for all of the government food programs. It provided the foundation for a food system assessment countywide.³⁴

Figure 4 shows the percentage of individuals with incomes at or below 200 percent of the FPL (CHIS sample) who have experienced food insecurity in Kern County over the past 15 years.

27 Definitions of Food Security. (n.d.). Retrieved January 31, 2017, from <http://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/definitions-of-food-security.aspx>

28 Coleman-Jensen, A., Rabbit, M., Gregory, C., & Singh, A. (2016). Household Food Security in the United States in 2015; Economic Research Report No. (ERR-215) September 2016; Retrieved February 23, 2017 from <https://www.ers.usda.gov/publications/pub-details/?pubid=79760>

29 Annual Update of the HHS Poverty Guidelines. (2014, January 22). Retrieved March 02, 2017, from <https://www.federalregister.gov/documents/2014/01/22/2014-01303/annual-update-of-the-hhs-poverty-guidelines>

30 U.S. Census Bureau. Quick Facts, Kern County. (n.d.). Retrieved March 02, 2017, from <http://www.census.gov/quickfacts/table/IPE120215/06029>

31 Kern County Economic Development Corporation (KEDC). Retrieved January 31, 2017, from <http://www.kedc.com/>

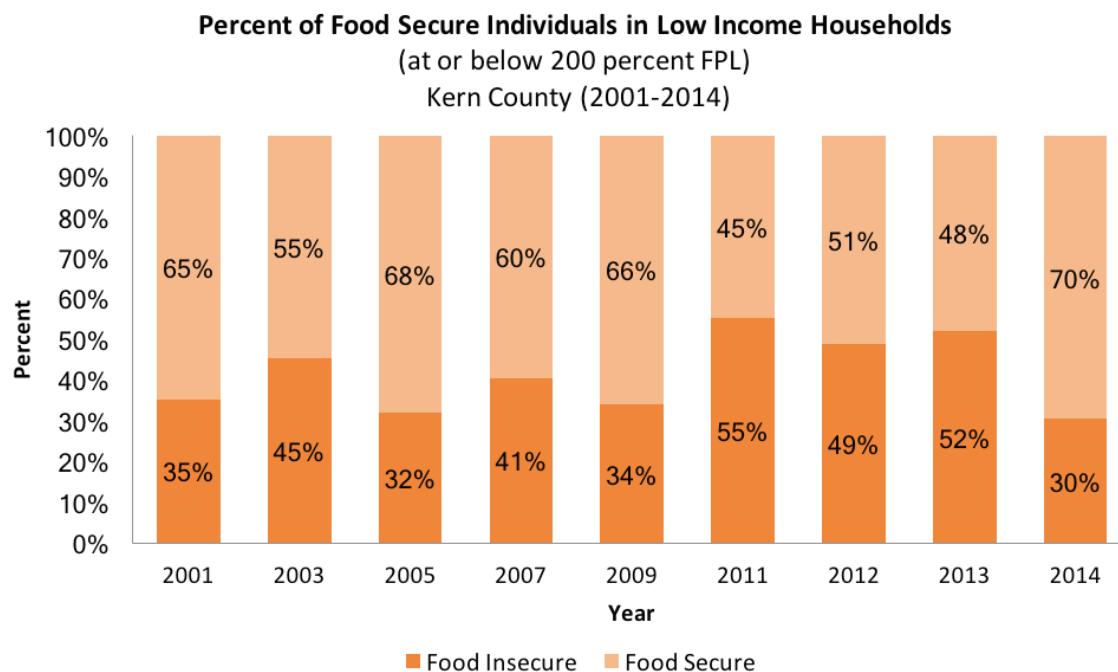
32 Gallup measures "food hardship" based on responses to the question "Have there been times in the past twelve months when you did not have enough money to buy food that you or your family needed?" Though this is not the same question asked by the U.S. Census Bureau to produce annual "food insecurity" numbers, the concepts of food hardship and food insecurity are comparable.

33 Food Research & Action Center. (2016). "How Hungry is America?" FRAC's National, State, and Local Index of Food Hardship, June 2016.

34 Bernhart, B., & Venkatesh, S. Community Food Report, May 2014. Community Action Partnership of Kern. Retrieved February 23, 2017 from: http://www.morningstarfresh.org/images/pdf/kfpc_food_report.pdf

Figure 4. Percent of food secure and food insecure individuals in households with incomes at or below 200 percent of the Federal Poverty Level.

Source: 2014 California Health Interview Survey. Only includes adults from households with incomes at or below 200 percent of the Federal Poverty Level.



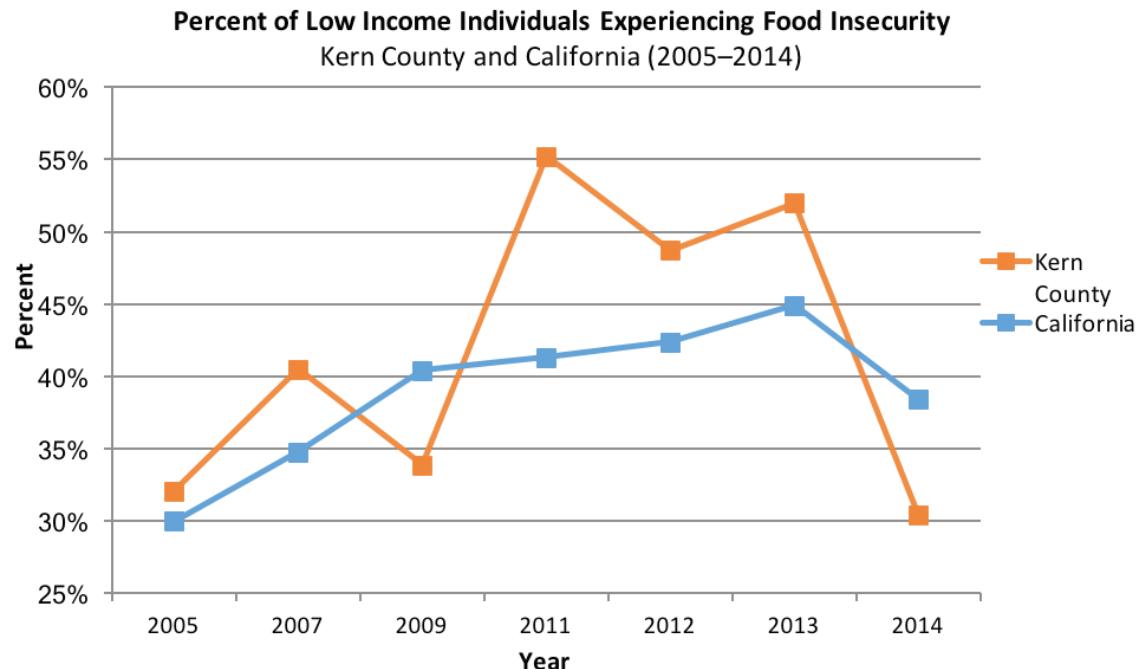
According to CHIS data, 30.4 percent of Kern County adults living at or below 200 percent of the Federal Poverty Level (FPL) reported experiencing food insecurity in 2014. This is the lowest rate reported across the 14 year span in the dataset. The year with the highest percentage of food insecurity in Kern County was 2011, with 55.2 percent of low income³⁵ adults experiencing food insecurity.

In most years, a higher percentage of low income adults in Kern County have reported experiencing food insecurity than at the state level (see Figure 5). However, the most recent year of data (2014) is an exception, with a lower food insecurity rate in Kern County compared to California.

³⁵ "Low income," in the context of this section, refers to individuals or households with incomes at or below 200 percent of the Federal Poverty Level (FPL)

Figure 5. Percent of low income individuals (household incomes at or below 200 percent of the Federal Poverty Level) experiencing food insecurity in Kern County and California (2005–2014)

Source: California Health Interview Survey, years 2005–2014. Only asked of adults with income less than 200 percent of the Federal Poverty Level.



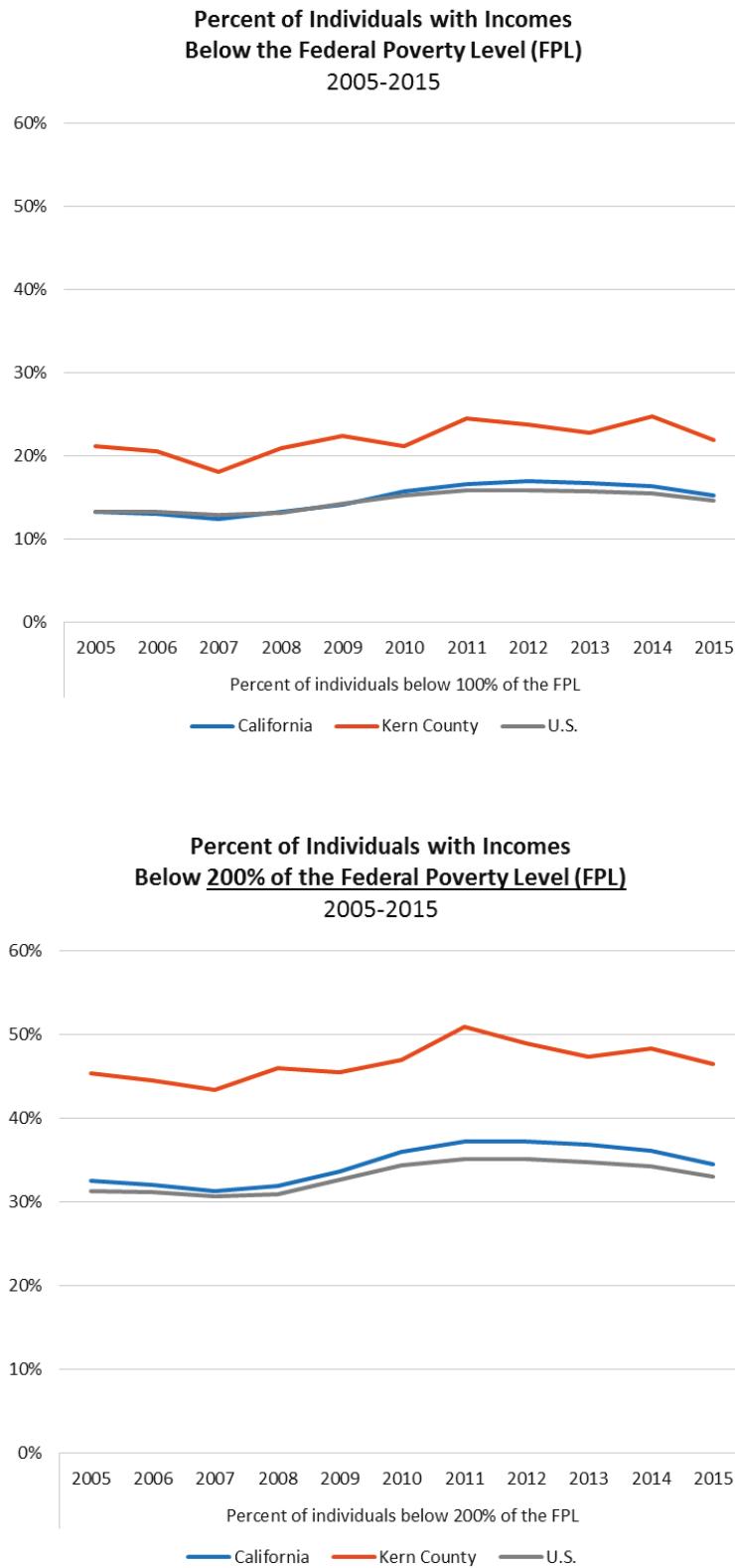
In addition to higher food insecurity rates among low income households in Kern County relative to the rest of California, CHIS-reported food insecurity levels in Kern County represent the experience of a higher percentage of the total population due to higher than average poverty rates in Kern County.

Figure 6 shows the number of individuals below the Federal Poverty Line (FPL) in Kern County, California, and the U.S., as well as the number of individuals below 200 percent of the FPL (those included in the CHIS food insecurity rates).

By both measures, a significantly higher percentage of individuals in Kern County are low income than at the state or national level. In Kern County, close to half the population earns less than 200 percent of the FPL, which represents a low income population that is 10 to 15 percent larger (as a percentage of total population) than at the state or national level.

Figure 6. Percent of individuals with incomes below 100 percent and 200 percent of the Federal Poverty Level in Kern County, California, and the U.S. (2005–2015)

Source: United States Census Bureau, American Fact Finder



The decrease in food insecurity in Kern County in 2014 is puzzling, as poverty rates in Kern County have remained high, suggesting that the decrease in food insecurity does not reflect increased incomes.

One possible explanation is that more low income individuals and households made use of emergency food sources (like food banks) in 2014, and thus did not consider themselves food insecure.

In January of 2014, Governor Jerry Brown declared a drought emergency in California. The resulting California Emergency Drought Relief Bill of 2014 included up to \$25 million in funding to the California Department of Social Services (CDSS) for temporary food aid through the Drought Food Assistance Program (DFAP).³⁶ DFAP provided food boxes to food banks in the California counties most impacted by the drought, including Kern County.³⁷ In Kern County, these boxes were distributed by the Community Action Partnership of Kern (CAPK) in Bakersfield.³⁸

The California food security rates reported through CHIS are based on responses to the following six questions:³⁹

1. “The food that I bought just didn’t last, and I didn’t have money to get more.”
2. Was that often, sometimes, or never true for you in the last 12 months?
3. “I couldn’t afford to eat balanced meals.”
4. Was that often, sometimes, or never true for you in the last 12 months?
5. In the last 12 months, since (date 12 months ago), did you (or other adults in your household) ever cut the size of your meals or skip meals because there wasn’t enough money for food?
6. How often did this happen—almost every month, some months but not every month, or in only 1 or 2 months?
7. In the last 12 months, did you ever eat less than you felt you should because there wasn’t enough money to buy food?
8. In the last 12 months, since (date 12 months ago), were you ever hungry but didn’t eat because you couldn’t afford enough food?

Food banks and other emergency food sources rarely provide all the food that an individual or household needs. However, an individual might answer “no” to the CHIS food insecurity questions if emergency food supplementation helped stretch their food budget enough to avoid skipping meals or going hungry.

However, traditional definitions of food security do not consider emergency food as a means of creating food security. The USDA ERS defines food security as “the state in which all persons obtain a nutritionally adequate, culturally acceptable diet at all times *through nonemergency sources*.⁴⁰

Based on the available information, it seems likely that the decrease in food insecurity in Kern County in 2014 was an outlier reflecting the success of the temporary food assistance program DFAP, rather than a true or sustainable downward trend in food insecurity.

36 Food Assistance Available In Counties Hardest Hit by California Drought. (n.d.). Retrieved March 02, 2017, from <http://sacramento.cbslocal.com/2014/06/02/food-assistance-available-in-counties-hardest-hit-by-california-drought/>

37 Passavant, W. (n.d.). Food. Retrieved March 02, 2017, from <http://www.cdss.ca.gov/cdssweb/PG55.htm>

38 Passavant, W. (n.d.). Food. Retrieved March 02, 2017, from <http://www.cdss.ca.gov/cdssweb/PG55.htm>

39 Methodological Note: 6/2012. Tracking food security in California with the California Health Interview Survey. Retrieved March 02, 2017 from <http://healthpolicy.ucla.edu/publications/Documents/PDF/foodpbmethodjun2012.pdf>

40 Cohen, B. E. (2002). *Community food security assessment toolkit*. Washington, DC: US Department of Agriculture, Economic Research Service.

INDICATOR 1.2.2: Eligibility and redemption of CalFresh benefits in Kern County.

Background

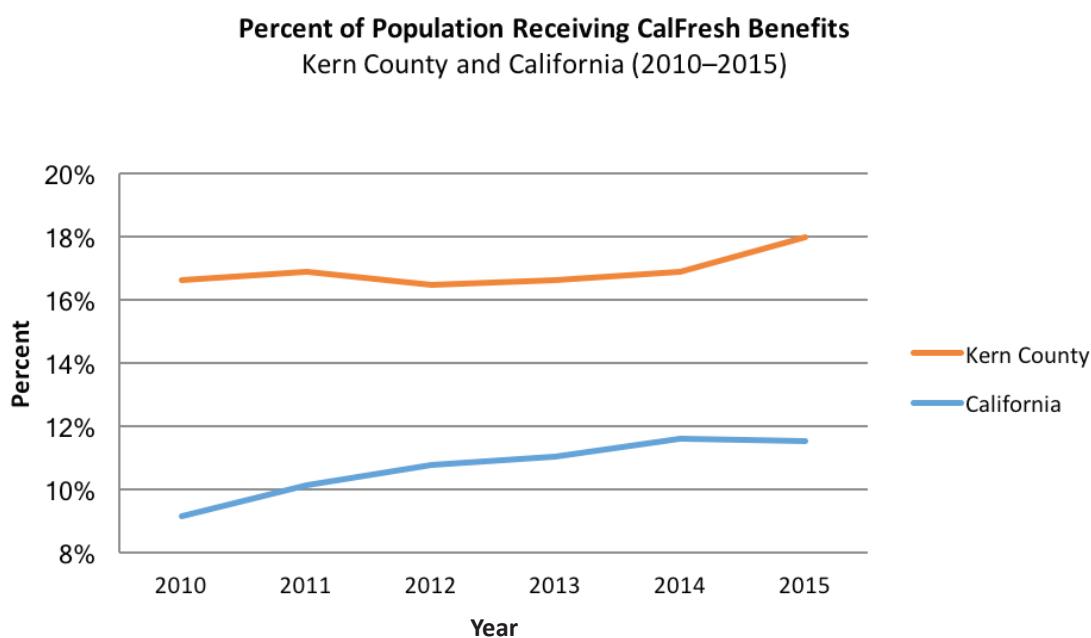
The Supplemental Nutrition Assistance Program (SNAP), formerly called Food Stamps, is known in California as CalFresh. For qualifying low income households, CalFresh provides a monetary supplement to the household food budget. CalFresh benefits can be redeemed for food at most grocery stores, many convenience stores, and an increasing number of farmers markets statewide.

Most households are eligible to receive CalFresh benefits if their gross income is at or below 200 percent of the Federal Poverty Level and their net income (gross income minus eligible expenses) is no more than 100 percent of the FPL.⁴¹ Certain households may have different requirements, such as households with a senior or disabled family member.⁴² Over the last five years, from nine to 12 percent of households in California have been eligible for CalFresh and just over half of eligible households have actually received benefits, though that percentage is growing.

Kern County Trends

Between 2010 and 2014, the percentage of the population receiving CalFresh benefits in Kern County has remained steady at around 16.5 percent with an increase to 18 percent in 2015. The rate of CalFresh use in Kern County has consistently been five to eight percentage points higher than the California average. Even though food insecurity levels have varied in Kern County, including a significant decrease in 2014 (see Indicator 1.2.1) the number of individuals receiving CalFresh benefits has remained relatively stable (see Figure 7).

Figure 7. Percent of population⁴³ receiving CalFresh benefits in Kern County and California (2010–2015)
Source: California Department of Social Services, CalFresh County Data Dashboard



41 The income level for eligibility was increased in the 2014-2015 budget. It was previously 130 percent of the FPL.

42 Passavant, W. (n.d.). Eligibility and Issuance Requirements. Retrieved March 08, 2017, from <http://www.calfresh.ca.gov/Pg841.htm#inc>

43 In CalFresh records, individuals are referred to as "persons." This is distinct from households. The rates given here represent the total amount of individuals receiving CalFresh benefits in Kern County divided by the total population of Kern County.

Figure 8 shows the percentage of households eligible for CalFresh that actually received these benefits each year.

While CalFresh eligibility is determined primarily by income and thus fluctuates with average income and poverty rates, actual rates of CalFresh use depend on eligible households actually applying and using benefits.

California has the lowest participation rate in SNAP/CalFresh among working families of any state in the U.S. and is tied for the lowest overall participation rate.

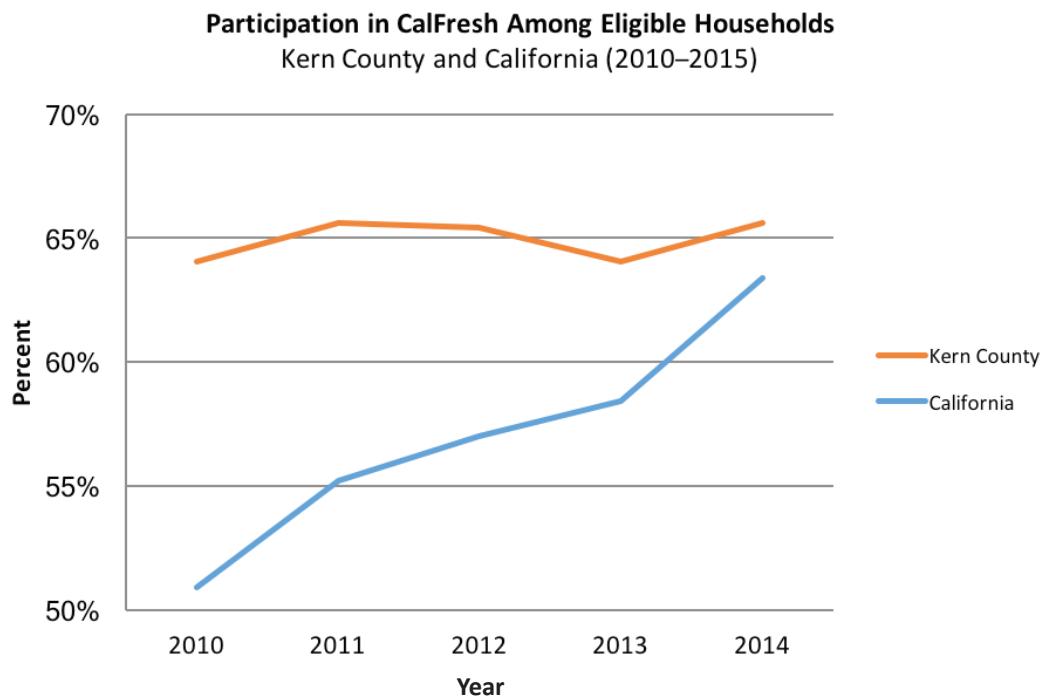
There are a variety of reasons that eligible households do not apply for CalFresh benefits, including perceived stigma, lack of knowledge about the program, or difficulty in managing the requirements of the application process. Challenges may include limited access to transportation, language barriers, or difficulty getting time off from work during the day to apply in person. In Kern County, approximately 35 percent of households that would be eligible for CalFresh are not receiving it.

Efforts to improve the number of eligible households taking advantage of CalFresh include various ways of streamlining the enrollment process to lower barriers to participation and reduce confusion among eligible households.⁴⁴

Figure 8 shows the participation rate in CalFresh among eligible households in Kern County and California. Kern County consistently has better (higher) rates of participation in CalFresh among eligible households than the rest of the state.

Figure 8. Participation in CalFresh Among Eligible Households in Kern County and California

Source: California Department of Social Services, CalFresh County Data Dashboard



⁴⁴ Policymakers Take Steps to Improve Food Security, but Opportunities to Address Hunger Remain. (2015, September 08). Retrieved March 08, 2017, from <http://calbudgetcenter.org/blog/policymakers-take-steps-to-improve-food-security-but-opportunities-to-address-hunger-remain/>

INDICATOR 1.2.3: Produce distribution and edible waste reduction through Kern County's food recovery and distribution systems.

Background

Food banks and gleaning programs have traditionally served as a mechanism for connecting food insecure populations with food that might otherwise go to waste. The two main purposes of these programs are (1) to improve food security among low-income residents, and (2) to reduce edible food waste through food recovery and distribution. Due to spoilage rates and the cost of refrigeration associated with produce distribution, food banks have generally distributed primarily canned, dried or similarly non-perishable food. However, as the health impacts of processed food, including high fat, sugar and preservative content, have become better understood, interest and support for fresh food distribution through food banks has grown.

Approximately 30 to 40 percent of the food produced in the U.S. goes to waste. In 2010, 133 billion pounds valued at \$161 billion went uneaten, \$47 billion of which never even reached consumers.⁴⁵ In addition to dollars lost, food waste also represents the wasted labor, energy, water, and other resources that go into producing, processing, distributing, storing, and disposing of the food that was never eaten.

Food waste includes food scraps thrown away after preparing and consuming food at home, as well as food that never reaches consumers, such as food that expires at a grocery store or is never harvested from a field.

One way to reduce the amount of edible food that is wasted prior to reaching consumers is through food recovery programs, such as those run by food banks and gleaning operations. Food recovery activities may include picking up donated perishable foods (including produce) from grocery stores or farmers markets, or harvesting fruits and vegetables from fields when it is no longer profitable for a farm to do so themselves.

Recovering food that would otherwise be wasted and distributing it to food insecure households has the potential to benefit producers, consumers, and the environment.

Kern County Trends

There are hundreds of emergency food distribution centers in Kern County run through faith-based organizations and nonprofits. An unofficial count places the number of emergency food distribution centers at over 400 in Bakersfield alone.⁴⁶

Three organizations account for the majority of the emergency food distribution in the Bakersfield metropolitan area. These organizations are:

9. The Garden Project, a nonprofit dedicated to gleaning, collecting, organizing, and redistributing fresh produce in and around Bakersfield⁴⁷
10. The Community Action Partnership of Kern (CAPK), an anti-poverty nonprofit that also runs a food bank
11. Golden Empire Gleaners, a nonprofit food bank that collects and redistributes produce and other food that would have otherwise gone to waste⁴⁸

There are significant efforts being made to collect and redistribute perishable food in Kern County.

⁴⁵ USDA | OCE | U.S. Food Waste Challenge | FAQ's | Information Sources. (n.d.). Retrieved March 08, 2017, from <https://www.usda.gov/oce/foodwaste/sources.htm>

⁴⁶ United Way of Kern County

⁴⁷ Father Jack Estes & Amber Beeson, The Garden Project

⁴⁸ See www.goldenempiregleaners.org

CAPK has increased the amount of food distributed every year since 2012. The Garden Project gleans an average of 20,000 pounds of produce per year. Golden Empire gleans or collects around two million pounds of food per year, and serves an average of 160,000 individuals annually.⁴⁹

There is no other organized, up to date, publically available data source that tracks the total amount of produce distributed through the emergency food system in Kern County. Table 3 shows estimates of produce and other types of food provided by the three organizations above, which were collected for the purpose of this assessment.⁵⁰

Table 3: Food recovery and distribution by emergency food providers in Kern County (2012- 2015)⁵¹

Source: Personal communication with CAPK, Golden Empire Gleaners, and The Garden Project

Year	Pounds of Food Collected/Gleaned	Pounds of Food Distributed	Number of People Served	Number of Families Served
CAPK Food Bank				
2012		6,104,490		
2013		7,733,295		
2014		12,247,419		272,484
2015		13,500,000		
Golden Empire Gleaners				
2014	2,630,831	2,490,098	171,148	14,284
2015	1,966,753	1,771,428	154,056	12,676
The Garden Project				
2012	15,126			
2013	28,224			
2014	20,298			
2015	19,832			

INDICATOR 1.2.4: Walkability to grocery stores

Background

The built environment can have a significant influence over how easy or difficult it is for community members to access affordable, healthful, and culturally appropriate foods. If an individual does not live in a centrally located neighborhood, does not own a personal vehicle, or does not have access to affordable and convenient public transportation, choices of where to purchase food can be greatly reduced.

Cities around the country are increasingly implementing sustainability plans that incorporate a certain level of “walkability” to grocery stores and other commercial centers. For the purpose of this report, “walkability” is “the extent to which walking is readily available as a safe, connected, accessible and pleasant mode of transport.” For urban designers, this typically means that a home and a

49 The data in Table 3 only account for what has been documented by these three organizations and does not represent all food recovered and distributed in Kern County.

50 During the writing of this assessment, a survey was developed by United Way of Kern County on behalf of the Kern County Homeless Collaborative to assess the existing emergency food distribution/collection in Bakersfield. This may be a useful tool for tracking produce distributions in the future.

51 Individuals and families may be served by multiple food providers so there may be some duplication in number of families served.

PHOTO CREDIT: DOUG KESSER



Bakersfield, Kern County.

commercial center are located within a radius of a quarter to a half mile (a five to ten minute walk) of each other. When a neighborhood is walkable, individuals do not need to rely on private transportation to be able to enjoy shopping centers, parks, and other opportunities nearby.

Kern County Trends

Figure 9 shows a snapshot of how the built environment may influence food access in Bakersfield, the most populated city in Kern County. This map incorporates several pieces of important data related to access to grocery stores and transportation.

The color shading (blue, yellow, orange, and red) represents the percentage of households that do not have access to a personal vehicle. The red and orange areas contain the highest percentage of households without access to a vehicle (up to 60 percent without a vehicle). Almost all households in the blue areas have access to a vehicle.

The purple building symbols represent large grocery stores, and the circles around them represent a half-mile radius. Please refer to map legend for more detail or the larger, interactive version on line at: <http://bit.ly/kernvehiclemap2016>

The map highlights several areas where there are both a high percentage of households without a vehicle and no grocery store within walking distance. In some cases there are small grocery stores, convenience stores, or farmers markets within these neighborhoods, but no large, full service grocery stores.

The map also shows areas where most households have access to a vehicle and also live within walking distance of a major grocery store.

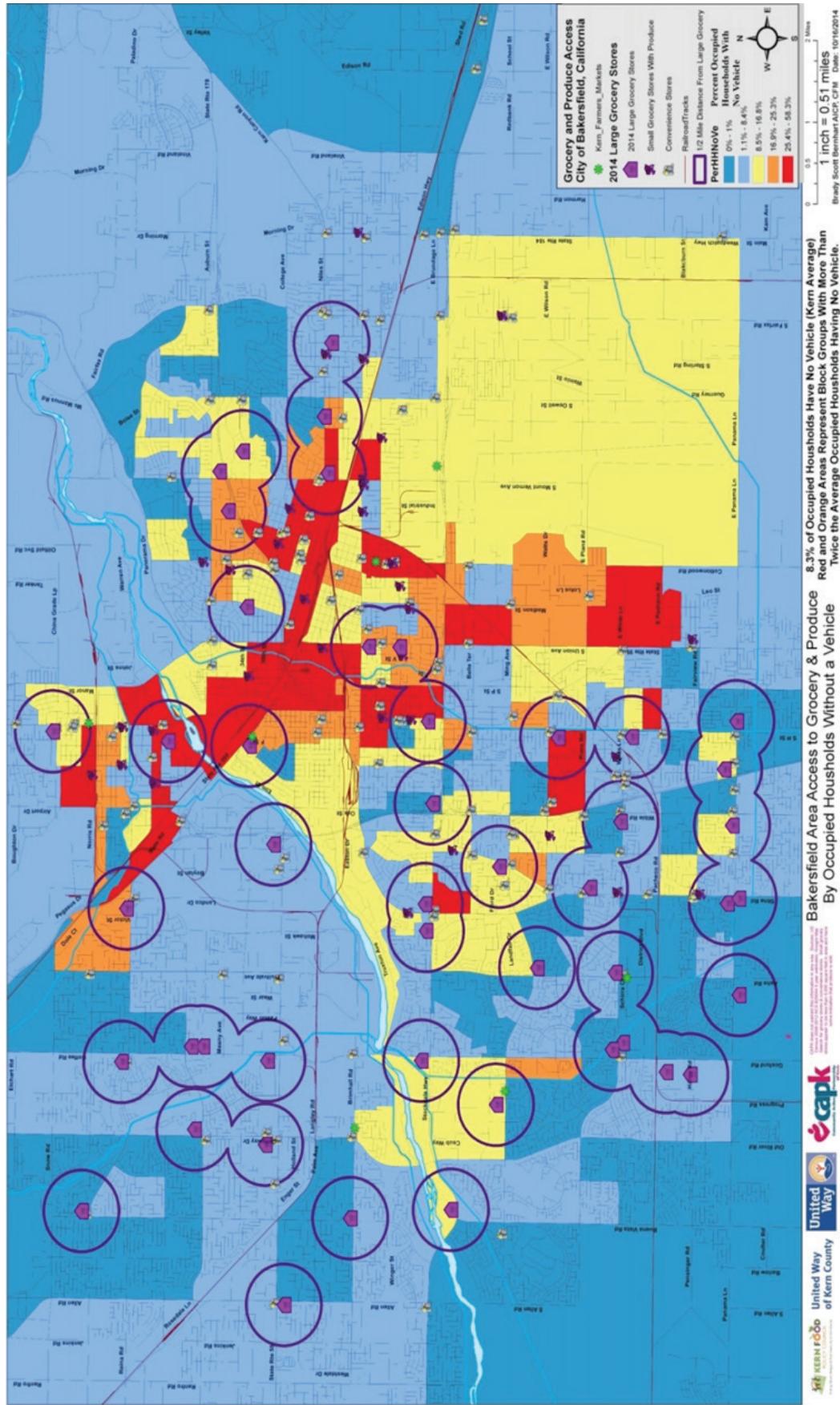


Figure 9: Access to grocery stores and personal transportation in Bakersfield

Source: Community Action Partnership of Kern (CAPK)

VISION 2



VISION 2: Healthy Local Food Economy

Background and National Trends

Over the past several decades, local food economies have grown as consumer demand for local food has risen.¹

Although exact definitions of “local” vary, local food generally refers to food that is grown or processed within a few hundred miles of where it is consumed.

A wide range of businesses and organizations participate in local food economies. These include farms, processors, distributors, grocery stores, farmers markets, restaurants, schools, gardens, food banks, and others.

Some actors in the local food economy, such as smaller farms, farmers markets, or community gardens, participate primarily in local markets. Others—including larger farms, processors, and distributors—also participate in national or international markets.

California and Kern County are both known for their contributions of fresh fruits, vegetables, nuts, and dairy to national and international markets. Over one third of the vegetables and two thirds of the fruits and nuts consumed in U.S. are grown in California,² and some of the largest food manufacturers in the world rely on Kern County’s agricultural abundance.³

This section, however, looks specifically at Kern County’s *local* food economy. This includes:

- (a) those food production, distribution, and sales activities that serve local markets and
- (b) local job opportunities in the Kern County food system.

1 Low, S. A., Adalja, A., Beaulieu, E., Key, N., Martinez, S., Melton, A., Perez, A., Ralston, K., Stewart, H., Suttles, S., Vogel, S., & Jablonski, B.B.R. (2015). Trends in US local and regional food systems: A report to Congress. Economic Research Service.

2 California Department of Food and Agriculture. (n.d.). California Department of Food and Agriculture 2015 Crop Year Report. Retrieved March 08, 2017, from <https://www.cdfa.ca.gov/statistics/>

3 Chapman, R., Holsonbake, C., & Evans, M. (2012). Kern County Labor Market Study. Kern County Economic Development Corporation.



Locally produced nut butters at the Hen's Roost in Bakersfield.

PHOTO CREDIT: JILL EGLAND

National trends in food production, distribution, and sales

Over the last decade, local food sales have increased across the country. Local foods can be purchased at many grocery stores, found in prepared meals at some schools and restaurants, and be purchased directly from local farms. The USDA defines local food sales as including both direct-to-consumer sales and sales through intermediaries, and both categories are growing.

Although a relatively small number of all farms sell local food directly to consumers, direct-to-consumer sales—including farm stands, U-picks, Community Supported Agriculture boxes (CSA), and farmers markets—are an important market channel for many farms, particularly smaller farms. Nationally, 70 percent of the farms that sell food locally only sell directly to consumers.

Most farms that sell directly to consumers (85 percent) are small, with a gross annual income of less than \$75,000, and three quarters had annual direct sales of less than \$5,000 in 2012. Although they are the most numerous type of farm selling locally, the total sales of these smaller farms only represent 13 percent of total dollars spent on local food. Larger farms (those with a gross annual income of \$350,000 and above), though making up just 5 percent of the total farms that sold products locally in 2012, represented 67 percent of all local food sales in the U.S.⁴ These mid-scale and larger farms are more likely to sell locally through intermediaries like distributors or food hubs, rather than selling directly to consumers.

At most grocery stores and some farmers markets, consumers are able to use public benefits like the Supplemental Nutrition Assistance Program (SNAP) to purchase local foods. There are also a growing number of SNAP-based incentive programs, funded and managed by non-profits or local governments, which provide matching funds to consumers using SNAP benefits at farmers markets.⁵ Consumers may also access local foods through community gardens, food banks, or Farm to School programs.

⁴ Low, S. A., Adalja, A., Beaulieu, E., Key, N., Martinez, S., Melton, A., Perez, A., Ralston, K., Stewart, H., Suttles, S., Vogel, S., & Jablonski, B.B.R. (2015). Trends in US local and regional food systems: A report to Congress. Economic Research Service.

⁵ USDA Food and Nutrition Services. (2014). Nutrition Assistance Program Report. Farmers Market Incentive Provider Study.

PHOTO CREDIT: SUSAN REEP



National trends in job opportunities in the food system

The food system is the largest source of employment in the U.S., currently employing over 21 million workers (14 percent of all workers). Employment in the food system is also growing, increasing at a rate more than double that of all other industries for the past decade.⁶ These jobs, however, pay lower wages on average than jobs in other industries, and food systems workers are twice as likely to rely on SNAP benefits as other workers.⁷

Kern County Trends

Local food production, distribution, and sales

Total agricultural sales in Kern County have been on a steady increase since 2002 (See Goal 2.1) but trends in direct-to-consumer sales and number of farms have been more variable. Although sales almost doubled overall from 1997 to 2012, the number of farms with direct sales has declined. In 2012, the most recent year of data, 134 farms in Kern County sold directly to consumers, with average direct sales per farm of \$44,328, more than double the California average of \$19,785 and four times the national average of \$9,063.⁸

The number of farmers markets in Kern County decreased from 16 to 12 between 2013 and 2016, however two additional markets now accept SNAP benefits.

Institutions also participated in increasing sales in the local food economy. Only a handful of schools in Kern County reported participating in Farm to School activities in over the last five years, but those that did are buying approximately one third of their produce locally.

In addition to local food sales, community members also produce some of their own food. There are 16 community gardens in Kern County, most located in the Bakersfield area.

Farms also participate in non-economic activities in the food system by supporting food recovery and distribution. The total number of pounds of donated and gleaned food has continued to rise in Kern County from 2012 to 2015 (see Indicator 1.2c).

Job Opportunities in the food system

The food system is a huge part of the local economy in Kern County, providing almost a third (29 percent) of the county's jobs, double the national average.

The largest sources of Kern County's food systems jobs in 2014 were farm support services (including farmworkers, farm management, and farm labor contractors) and food service. As is true at the national level, wages in Kern County's food system fall below all-industry averages, particularly in the subsectors with the most workers. In 2014, the average annual wage in the Kern County food system was \$24,182, compared to \$43,737 for all industries.

6 Food Chain Workers Alliance and Solidarity Research Cooperative. (2016). No Piece of the Pie: U.S. Food Workers in 2016. Los Angeles, CA: Food Chain Workers Alliance.

7 Ibid.

8 USDA National Agricultural Statistics Service. (2014). Farmers Marketing: Direct sales through markets, roadside stands, and other means up 8 percent since 2007 (2014). Agriculture Census Highlights (ACH) - 7. U.S.

GOAL 2.1: Kern County improves regional economic opportunities for local food producers.

Background

Increased consumer demand for local food has created new economic opportunities for food producers who are interested in producing and marketing their products locally. There are a variety of marketing channels that connect producers and consumers of local foods, including direct-to-consumer sales, mediated sales through distributors, stores, or restaurants, and local sales to institutions like schools or hospitals.

EcoCentric Farm

EcoCentric Farms was founded in 2011 by Kimberly and Shanta Jackson, and is based in Bakersfield. EcoCentric designs, constructs, and operates innovative aquaponic and hydroponic grow systems on both commercial and residential scales. They have expertise in several methods including nutrient film technique (NFT), deep water culture (DWC), the Kratky method of non-circulating hydroponics, aeroponics, and vertical gardening.

Their most productive system is a 4,000 plant/4,000 gallon vertical aquaponic grow system. It only uses 10% of the water used by traditional farms at the same scale, is 10 times more productive per square foot than NFT, and generates its own organic fish feed and plant fertilizer.

EcoCentric Farms' goal is to increase community access to sustainably grown organic produce and seafood. By making maximum use of natural resources, increasing yield per square foot, and distributing locally, they can offer healthy alternatives at comparable prices to conventionally farmed food.



Kale growing at EcoCentric Farms.

PHOTO CREDIT: GAIL FEENSTRA



PHOTO CREDIT: GREG IGOR

Pomegranates growing in Kern County.

The most direct way consumers can access local food is to purchase it from a local farm. A small but growing number of mostly smaller farms engage in direct-to-consumer sales, which may take place at the farm itself (via a farm stand or U-pick), at a farmers market, or through a Community Supported Agriculture (CSA) subscription. In some cases these direct sales may result in higher profits for farms and lower prices for consumers due to reduced distribution costs. In other cases the primary benefit of direct sales may be a marketing or relationship-building opportunity.

Local food is also sold to local markets through standard distribution channels, and can be purchased at some grocery stores and restaurants. Larger farms, though they do sometimes engage in direct sales, are more likely to contribute to local markets through a distributor or other intermediary.

Farm to School programs are another way that local food can reach local consumers. While some Farm to School programs may focus primarily on school gardens, farm tours, or nutrition education, many also promote the procurement of local food for school meals. School districts that prioritize local procurement can create new market opportunities for farms.

The following indicators describe the variety of ways that consumers connect with local food producers in Kern County.

These are compared, when applicable, to the larger food economy, within California and nationally.

INDICATOR 2.1.1: Direct-to-consumer agricultural sales in Kern County

Background

Local sales, including direct-to-consumer sales, make up a small but important percentage of total agricultural sales. All three kinds of sales (total, local, and direct) appear to be increasing in recent years at the national level.⁹ California led the country in direct sales to consumers in 2012, with \$170 million in sales.¹⁰

⁹ Low, S. A., Adalja, A., Beaulieu, E., Key, N., Martinez, S., Melton, A., Perez, A., Ralston, K., Stewart, H., Suttles, S., Vogel, S., & Jablonski, B.B.R. (2015). Trends in US local and regional food systems: A report to Congress. Economic Research Service.

¹⁰ USDA National Agricultural Statistics Service. (2014). Farmers Marketing: Direct sales through markets, roadside stands, and other means up 8 percent since 2007 (2014). Agriculture Census Highlights (ACH) - 7. U.S.

MEASURE 1: Total dollars of direct-to-consumer agricultural sales

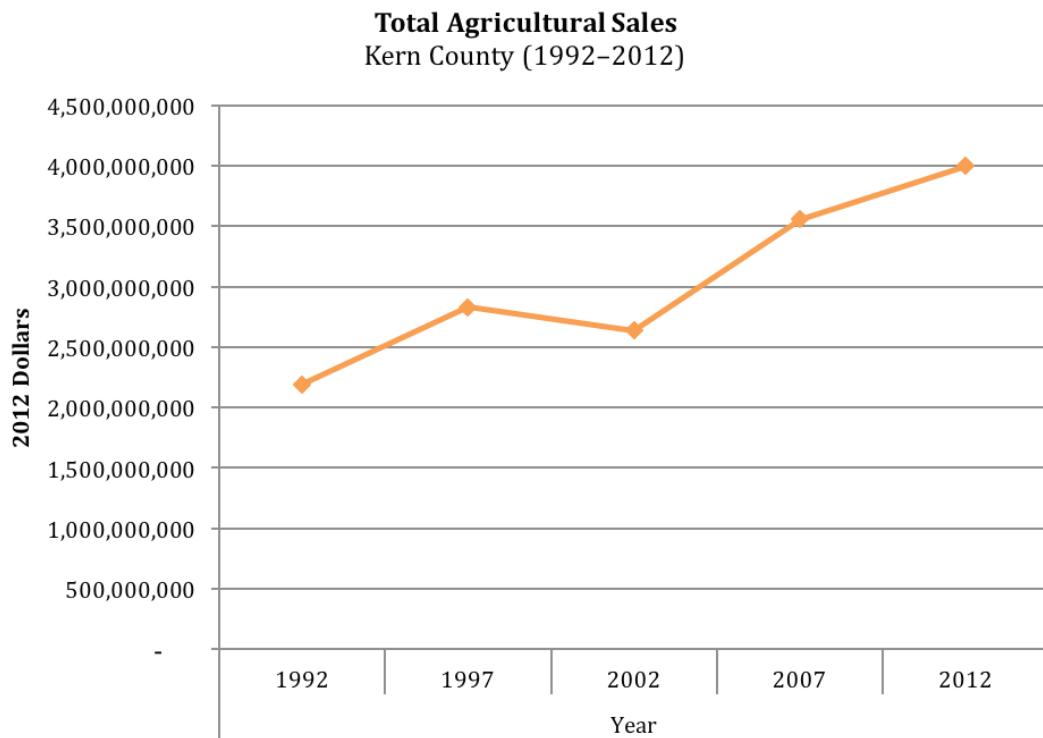
Kern County Trends

Agriculture is a major source of economic activity in Kern County, which ranks third in the state of California for total value of agricultural products sold. In 2012, this value was nearly 4 billion dollars.¹¹ Kern County farmers reported almost \$6 million in direct sales in 2012, though some of these may have taken place outside the county (for example, if a Kern County farmer traveled to a farmers market in Los Angeles).

According to the 2012 USDA Census of Agriculture, the total value of farm sales in Kern County has been steadily increasing since 1997 (see Figure 9).

Figure 9. Total agricultural sales¹² in Kern County (1992–2012)

Source: USDA National Agricultural Statistics Service (NASS), Census of Agriculture (1992–2012)



The dollar amount of direct farm sales in Kern County, shown in Figure 10, has also increased since the 1990s, despite a decline from its highest level in 2002. In 1997, the amount of total direct sales was approximately 3 million dollars. The amount in 2012 was almost double that at approximately 6 million dollars.

11 USDA National Agricultural Statistics Service. (2014). USDA 2012 census of agriculture. Retrieved March 08, 2017, from agcensus.usda.gov.

12 "Total agricultural sales" is a gross sales figure from which none of the costs of production, marketing, or distribution have been deducted. Care should be taken not to equate total agricultural sales with farm profits, which are influenced by a wide range of other factors.

Figure 10. Total direct agricultural sales in Kern County (1992–2012)

Source: USDA National Agricultural Statistics Service (NASS), Census of Agriculture (1992–2012)

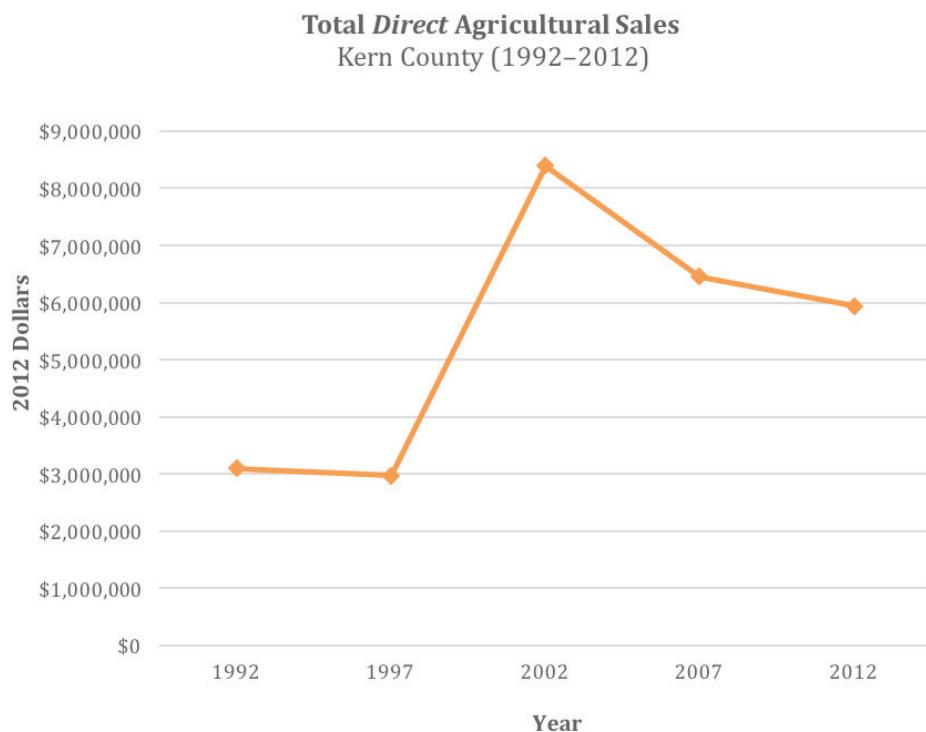


PHOTO CREDIT: DOUG KESSLER

MEASURE 2: Number of farms with direct-to-consumer sales in Kern County

Kern County Trends

The number of farms in Kern County with direct sales, shown in Figures 11 and 12, remained relatively consistent from 1992 to 2002, at around 150 farms. The number of farms with direct sales fell to 105 in 2007, and rose to 134 in 2012. The total number of farms in Kern County—those with and without direct sales—also decreased over the same time period, even as total dollars in sales have increased.

California strawberries

Figure 11. Number of farms with direct sales in Kern County (1992–2012)

Source: USDA National Agricultural Statistics Service (NASS), Census of Agriculture (1992-2012)

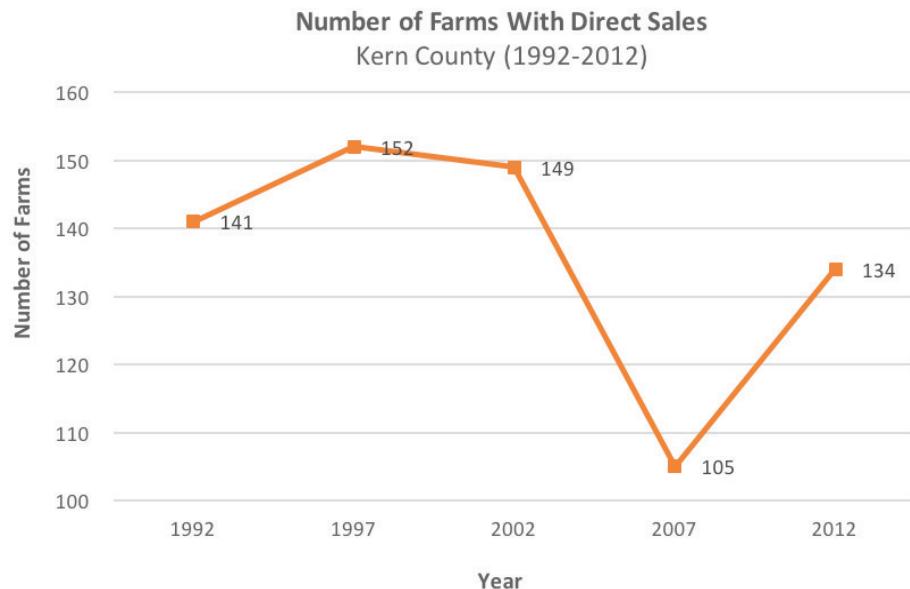


Figure 12. Total number of farms and number of farms with direct sales, Kern County 1997–2012

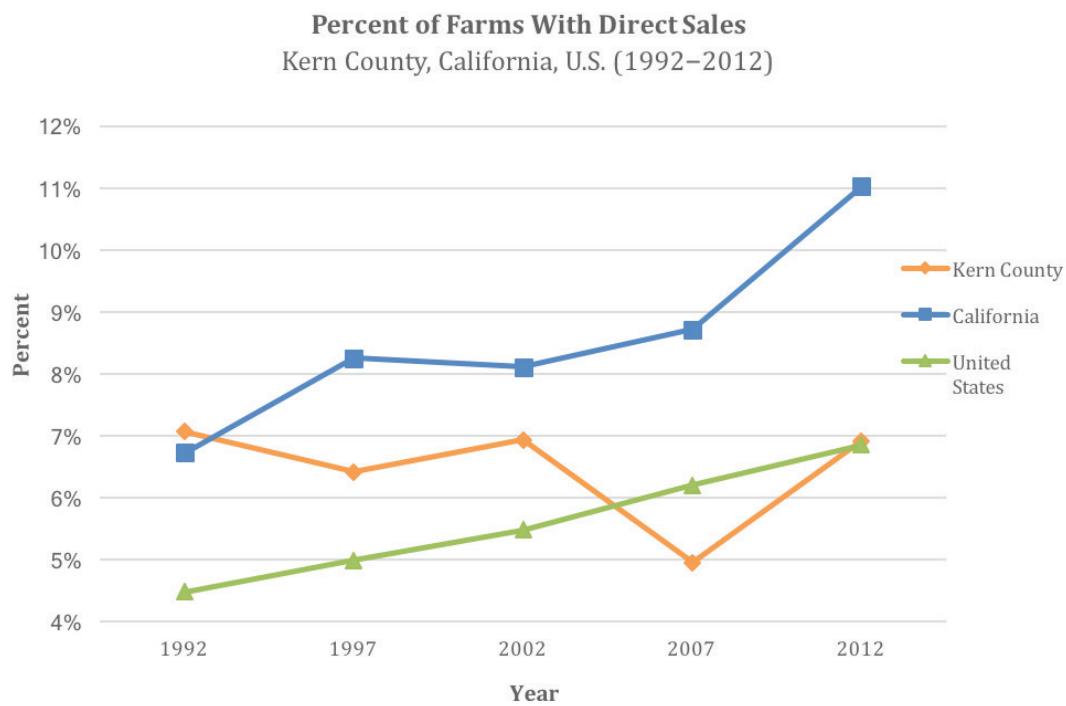
Source: USDA National Agricultural Statistics Service (NASS), Census of Agriculture (1992-2012)



Between 1992 and 2012, the percentage of farms that sold products directly to the public rose steadily both nationally and in California (see Figure 13). In Kern County, this percentage has stayed more or less the same over time, with an average of 6.5 percent of Kern County's farms selling directly to consumers. This is lower than California's average of 8.6 percent and higher than the US average of 5.6 percent over the same time period.¹³

Figure 13. Percent of farms with direct sales in Kern County, California, and the United States (1992–2012)

Source: USDA National Agricultural Statistics Service (NASS), Census of Agriculture (1992–2012)



MEASURE 3: Direct-to-consumer sales as a percentage of total agricultural sales in Kern County.

Kern County Trends

As shown in Figure 14, direct sales make up a lower percentage of total agricultural sales in Kern County than at the state or national level. Between 1997 and 2002, the percentage of direct sales versus all sales in Kern County tripled, but has fallen back to 1992 levels over the past decade.

13 Weighted averages based on USDA Census of Agriculture 1992, 1997, 2002, 2007, 2012

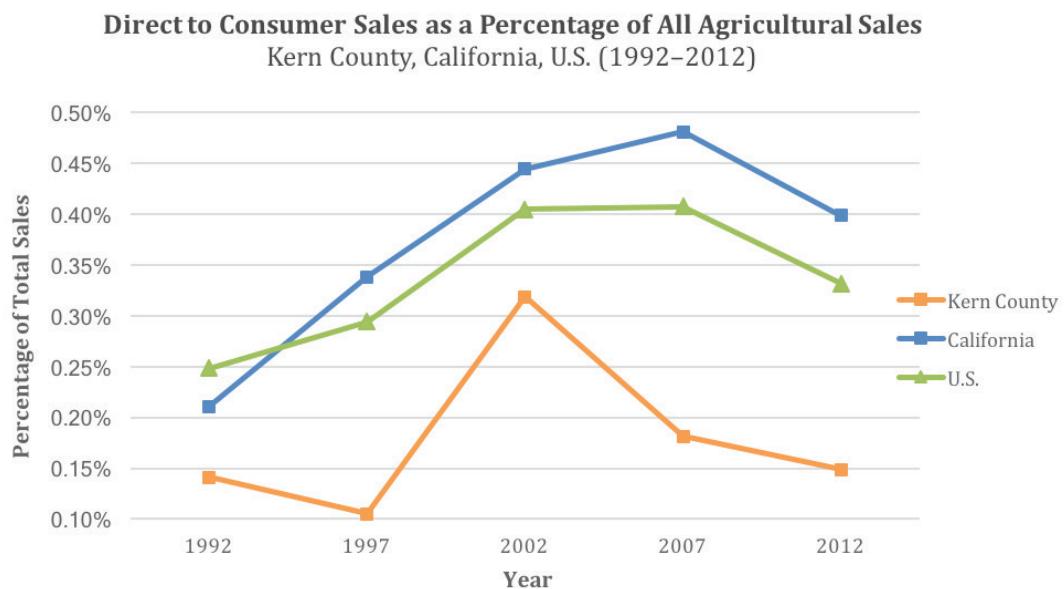


PHOTO CREDIT: SUSAN REEP

Cherries growing in Kern County.

Figure 14. Direct to consumer sales as a percentage of all agricultural sales in Kern County, California, and the United States (1992–2012)

Source: USDA National Agricultural Statistics Service (NASS), Census of Agriculture (1992–2012)



Direct-to-consumer sales in Kern and Fresno Counties

Fresno County is another Central Valley agricultural county with a similar climate and cropping patterns to Kern. Figure 15 shows total direct sales and number of farms involved in direct sales in each county. Figure 16 shows average direct sales per farm. We can see that Fresno supports more direct sales in total dollars and also has more farms involved in direct sales. Kern County farms involved in direct sales are fewer in number, but have higher average sales per farm in most years.

Figure 15. Direct agricultural sales in Kern and Fresno Counties in total dollars and total number of farms with direct sales (1992–2012)

Source: USDA National Agricultural Statistics Service (NASS), Census of Agriculture (1992-2012)

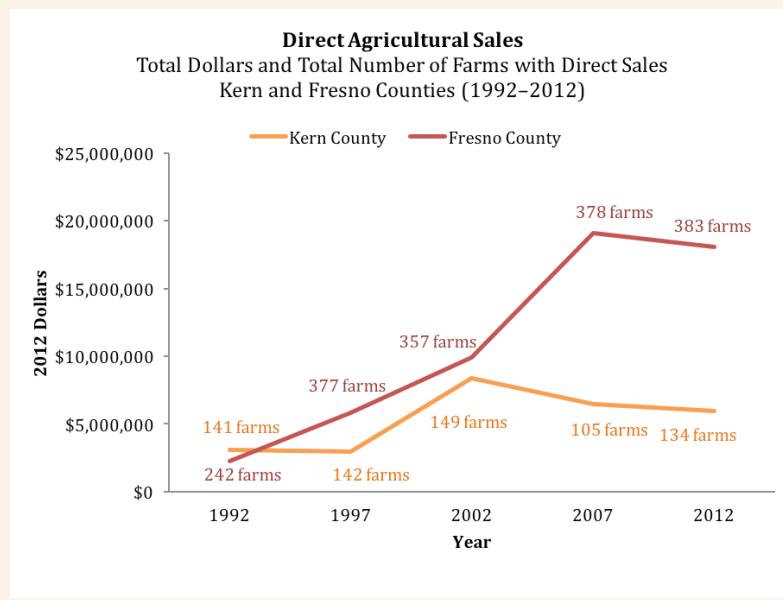
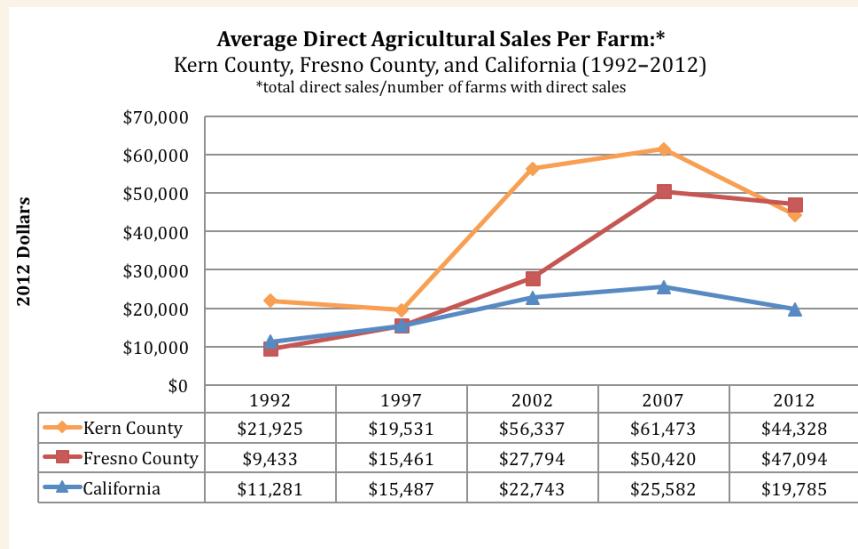


Figure 16. Average direct agricultural sales per farm

Source: USDA National Agricultural Statistics Service (NASS), Census of Agriculture (1992-2012)



INDICATOR 2.1.2: Number of Farm to School programs in Kern County

Background

Farm to School programs connect students and their families to fresh, healthy food and local agriculture. Participating school districts purchase food from local growers, support school gardens, and offer educational opportunities like nutrition, cooking lessons and farm field trips. Farm to School programs can help support local farms and food economies by expanding institutional markets for local food.

The USDA's Farm to School Program was established by the Healthy, Hunger-Free Kids Act of 2010. The first Farm to School Census was conducted in 2013 in order to establish realistic goals for increasing the availability of local foods in schools, and an additional census was conducted in 2015 to track progress. The Farm to School Census is a valuable tool to measure Farm to School activities across the country as well as in individual states and counties.

Nationally, Farm to School programs have grown exponentially since the 1990s when only a handful of programs existed across the country.¹⁴ In 2015, more than 42,500 schools in 5,254 districts and 23.6 million students participated in Farm to School programs, investing almost \$790 million in local farm products.¹⁵

Kern County Trends

Ten school districts in Kern County participated in the first Farm to School Census in 2013, which covered the 2011–2012 school year. Of those ten districts, six reported participating in Farm to School procurement activities. In 2015, eight districts participated in the survey and six reported Farm to School procurement activities.¹⁶ Six districts per year represent a 13 percent district participation rate in Farm to School in Kern County. However, the actual rate may be higher since so few districts completed the Farm to School Census.

In 2013, school districts participating in the Farm to School Census reported that 36 percent of school foods were sourced locally. In 2015 the rate among participating schools had dropped slightly to 31 percent.

The eight districts that completed the 2015 Farm to School Census and the way in which the six who purchased local food defined "local" can be found in Vision 1, Table 2.

INDICATOR 2.1.3: Number of food hubs and cottage food operators in Kern County

Background

Two additional types of local businesses that expand economic opportunities for local food producers are regional food hubs and cottage food operators.

The USDA defines a regional food hub as "a business or organization that actively manages the aggregation, distribution and marketing of source-identified food products primarily from local and regional producers to strengthen their ability to satisfy wholesale, retail and institutional demand."¹⁷ Food hubs provide economic opportunity to local food producers by giving them an opportunity to market and sell their goods in wholesale markets without losing their "local food" identity.

¹⁴ Feenstra, G., & Ohmart, J. (2012). The evolution of the school food and Farm to School movement in the United States: connecting childhood health, farms, and communities. *Childhood Obesity*, 8(4), 280–289.

¹⁵ USDA Food and Nutrition Service, Farm to School Program. (2016). 2015 Farm to School Census. Retrieved January 26, 2017 from <https://farmtoschoolcensus.fns.usda.gov/home>

¹⁶ Five school districts reported Farm to School activities in both years: Arvin Union Elementary, Bakersfield City, Beardsley Elementary, Panama-Buena Vista Union, and Richland Union Elementary.

¹⁷ Barham, J., Tropp, D., Enterline, K., Farbman, J., Fisk, J., & Kiraly, S. (2012). Regional food hub resource guide. U.S. Department of Agriculture, Agricultural Marketing Service, Washington, DC.

Cottage food operators are food producers that create food items on a small scale, oftentimes with locally sourced ingredients. Assembly Bill 1616, known as the California Homemade Food Act, went into effect January 1, 2013, and allows certain low risk foods, known as “cottage foods,” to be made in a private residence on a small scale and be sold to the public. The operators that run these businesses are known as Cottage Food Operators (CFOs). The limitations for how much revenue a CFO can produce is as follows:

\$35,000 or less in gross sales in 2013

\$45,000 or less in gross sales in 2014

\$50,000 or less in gross sales in 2015

CFOs are limited to producing food that is considered “potentially non-hazardous.” These are foods that do not require refrigeration to keep them safe from bacterial growth that could make people sick. Examples include candy, dried fruit, granola, honey, fruit tarts, preserves, jams, jellies, oil, vinegar, nut mixes, and nut butter.

All CFOs must apply for a permit and pay the associated fee, as well as undergo an inspection by the County Health Department annually or as needed. CFOs can only sell their products within their county, unless under special permission by the health department.¹⁸

Kern County Trends

In Kern County, there were a total of 102 cottage food industry permits issued in 2015.¹⁹

There are currently no food hubs within Kern County.²⁰

GOAL 2.2: All Kern County residents have access to local food

Background

Kern County's favorable climate and geography have made it one of the top agricultural producers in the nation, and local producers grow and distribute food year-round. This presents not just an economic opportunity, but also an opportunity to ensure that all community members have steady access to the fresh, healthy foods that are produced in Kern County.

However, high poverty rates, limited transportation options, and lack of markets in certain neighborhoods can make it challenging for some families to access the agricultural abundance around them. A range of local efforts are being made to help ensure that local foods are accessible to all consumers, regardless of income. These include building community gardens, local farms donating produce to food banks, the acceptance of SNAP benefits at farmers markets, and efforts to improve public transportation to local food markets.

INDICATOR 2.2.1: Acceptance of EBT at farmers markets in Kern County

Background

As the number of farmers markets continues to grow across the nation, so too has the recognition that many low-income community members face challenges in accessing these markets. In an effort to increase access for individuals or households receiving public assistance benefits such as CalFresh

18 Kern County Public Health Services. www.kernpublichealth.com.

19 Personal communication with Barbara Chambers at Kern County Department of Environmental Health

20 USDA. Food Hub Directory. (n.d.). Retrieved March 08, 2017, from <https://www.ams.usda.gov/local-food-directories/foodhubs>

(also known as SNAP or food stamps) or Woman, Infant and Children (WIC) vouchers, Electronic Benefit Transfer (EBT) machines are increasingly being utilized at farmers markets to enable redemption of these benefits for fresh, locally grown food. Acceptance of EBT payments at farmers markets may help broaden the customer base for participating farmers and increase community access to local, fresh foods.

Kern County Trends

In 2013–2014, there were a total of 16 certified farmers' markets in Kern County. Of these 16 markets, three markets had the capacity to accept public benefits through Electronic Benefit Transfer (EBT) machines. In 2015–2016, there were a total of 12 certified farmers' markets in Kern County. Of these 12 markets, five markets accepted EBT.²¹

The Hen's Roost

The Hen's Roost has created a unique concept in the local food scene: bringing Kern County farmers and vendors that you'd normally see at a farmer's market to a "pop-up" store front site in downtown Bakersfield.

The Hen's Roost, spearheaded by Jaclyn Allen, who also put together weekend farmer's markets in west and southwest Bakersfield, now operates as a small grocer each Wednesday on G Street. Allen hopes that their "keep it local" concept will give customers what they want: fresh, local products while keeping the money flowing within Kern County.

The grocery, located just off the corner of G Street and 19th Street, is open every Wednesday from 10 AM to 6 PM. In addition to fresh, local produce, customers can also buy sheep milk yogurt, hummus and other dips, French pastries and quiches, fresh breads, granolas, as well as locally produced peanut, cashew and almond butters.



Jaclyn Allen, owner of The Hen's Roost in Bakersfield.

PHOTO CREDIT: JILL EGLAND

²¹ The number and locations of farmers markets were difficult to verify. We used several lists (USDA, Kern County Department of Human Services, Kern County Department of Environmental Health, and the Agricultural Commissioner's Office), none of which agreed perfectly. Jessica Smith called each market in 2016 to verify EBT use.



PHOTO CREDIT: JILL EGAND

Kern County farmers market

Figure 16a. Farmers Markets with and without EBT use in Kern County

Source: USDA AMS; Kern County Dept. of Human Services; Kern County Dept. of Environmental Health; Jessica Smith, UC SAREP [contacted each market by phone, 2016]. Map by Brady Bernhart, CAPK.

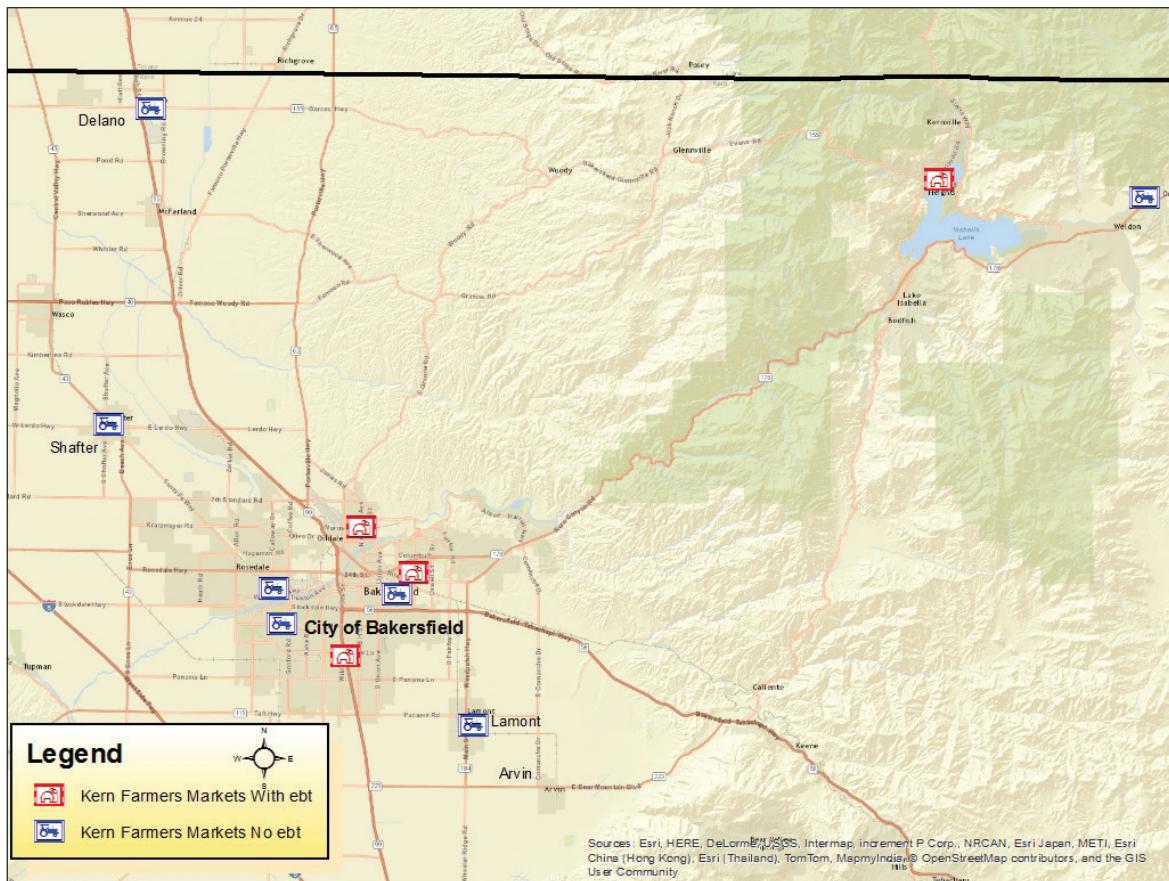


Table 4. EBT acceptance at Certified Farmers Markets in Kern County (2013-2014 and 2015-2016)

Sources: USDA AMS; Kern County Dept. of Human Services; Kern County Dept. of Environmental Health; Jessica Smith, UC SAREP [contacted each market by phone, 2016]

2013-2014 Certified Farmers Markets		2015-2016 Certified Farmers Markets	
Farmers Market Name	EBT Y/N	Farmers Market Name	EBT (Y/N)
The Oildale Farmers Market	N	The Oildale Farmers Market	N
Haggin Oaks Farmers Market	N	Haggin Oaks Farmers Market	N
Brimhall Market	N	Brimhall Market	N
Lakeshore Farmers Market Wofford Heights	Y	Lakeshore Farmers Market Wofford Heights	Y
Farmers Market Onyx Farmers Market	N	Farmers Market Onyx Farmers Market	Y
Nuui Cunni Farmers Market	N		
Valley Farmers Market Assoc - Bakersfield	Y	Valley Farmers Market Assoc - Bakersfield	Y
Valley Farmers Market Assoc - Shafter	Y	From the Farmhouse Shafter	Y
Tesch Family Farms Lamont (Clinica Sierra Vista)	N	Tesch Family Farms Lamont (Clinica Sierra Vista)	N
Tesch Family Farms Delano (Clinica Sierra Vista)	N	Tesch Family Farms Delano (Clinica Sierra Vista)	N
Tesch Family Farms Bakersfield (Clinica Sierra Vista)	N	Tesch Family Farms Bakersfield (Clinica Sierra Vista)	N
Main Street Farmers Market	N	Ridgecrest Certified Farmers Market	Y
Taft Famers Market	N		
Joe's Market	N	Kern County Community Farmers Market	N
South West City Slickers Farmers Market	N		
The Market Place	N		
TOTAL: 16 Certified Farmer's Markets		TOTAL: 12 Certified Farmer's Markets	
TOTAL EBT: 3		TOTAL EBT: 5	

INDICATOR 2.2.2: Number of community gardens in Kern County

Background

The American Community Garden Association defines a community garden as any piece of land gardened by a group of people.²² These spaces can be urban or rural, public or private, cover multiple acres or the space of a small backyard. Community gardens can increase physical activity and community pride, as well as improve nutrition and knowledge of food.²³ Community gardening is part of a renewed interest in local food production and consumption taking place all across California.

Kern County Trends

As of the writing of this report, there were a total of 16 community gardens in Kern County.²⁴ Figure 17 shows the locations of all known community gardens in Kern County, the majority of which are in the Bakersfield metropolitan area.²⁵ The names and addresses of these community gardens are listed in Table 5.

22 American Community Garden Association. www.communitygarden.org

23 Surls, R., Feenstra, G., Golden, S., Galt, R., Hardesty, S., Napawan, C., & Wilen, C. (2015). Gearing up to support urban farming in California: Preliminary results of a needs assessment. *Renewable Agriculture and Food Systems*, 30(01), 33–42.

24 Information compiled through personal communications with community partners, including Karen Bayne, University of California Cooperative Extension; Amber Beeson, The Giving Tree; Father Jack, The Gardening Project; and Gustavo Aguirre, Center for Race, Poverty and the Environment.

25 Bernhart, B. Community Action Partnership of Kern. www.capk.org

VISION 2: HEALTHY LOCAL FOOD ECONOMY



PHOTO CREDIT: SHOHSAA CAPPS

Community garden in Arvin, CA.

Figure 17. Community Gardens in Kern County

Source: Information compiled through personal communications with community partners, including Karen Bayne, University of California Cooperative Extension; Amber Beeson, The Giving Tree; Father Jack, The Gardening Project; and Gustavo Aguirre, Center for Race, Poverty and the Environment.

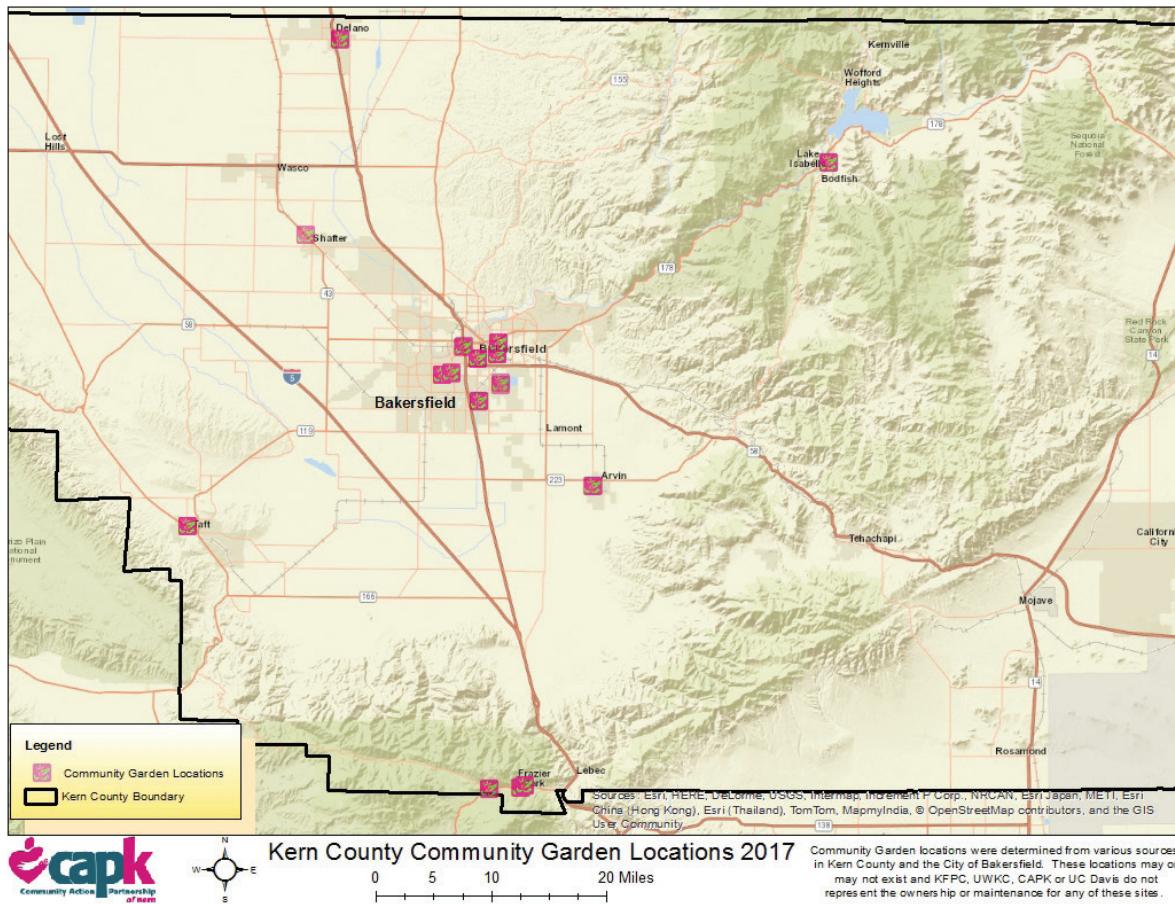


Table 5. Community Gardens in Kern County

Source: Information compiled through personal communications with community partners, including Karen Bayne, University of California Cooperative Extension; Amber Beeson, The Giving Tree; Father Jack, The Gardening Project; and Gustavo Aguirre, Center for Race, Poverty and the Environment.

Garden Name	Street Address	City	ZIP
Center on Race, Poverty, & the Environment – Arvin Garden	698 S. Comanche Rd	Arvin	93203
Seeds of Inspiration Community Garden	405 Eye Street	Bakersfield	93304
Center on Race, Poverty, & the Environment – Greenfield Walking Group Community Garden	5224 Jonah St	Bakersfield	93307
Kern City Community Garden	6510 Club View Dr	Bakersfield	93309
Rosewood Senior Living Garden	1301 New Stine Rd	Bakersfield	93309
Achievement Center	1721 Westwind Dr	Bakersfield	93301
Martin Luther King Community Center	1000 South Owens St	Bakersfield	93307
Friendship House	2424 Cottonwood Rd	Bakersfield	93307
Boys and Girls Club of Bakersfield	801 Niles St	Bakersfield	93305
Delano Community Hospital Community Garden	1401 Garces Hwy	Delano	93215
Frazier Park Community Gardens	3800 Park Dr	Frazier Park	93225
Green Dragon Community Garden – Oaks of Kern Farm	3433 Los Padres Drive	Frazier Park	93225
Kern River Valley Family Resource Center	5109 Lake Isabella Blvd	Lake Isabella	93240
Green Dragon Community Garden – Florence Cuddy Farm	335 Lakewood Place	Lake of the Woods	93225
Center on Race, Poverty, & the Environment – Shafter Garden	500 Fresno St.	Shafter	93263
Taft Community Garden	9th St & Kern St	Taft	93268

INDICATOR 2.2.3: Public transportation availability near local food markets in Kern County

Background

Although there may be delivery services available in some locations, for the most part, access to local foods depends on the ability to physically get to places where local food is sold. Not all community members have access to a personal vehicle, and for these community members public transportation routes may play a key role in whether or not they are able to purchase and consume local foods. Increasingly, developers and city planners are exploring methods by which community members can either walk to shopping centers and other commercial centers, or walk to public transportation that allows easy access to these places.²⁶

Kern County Trends

The following map²⁷ (Figure 18) shows all public bus routes in Kern County in relationship to food markets, farmers markets, convenience stores, and other food access points. Local foods may be purchased at any of these types of food access points, although all foods at all of these markets do not necessarily come from local sources (with the exception of farmers markets). This map also

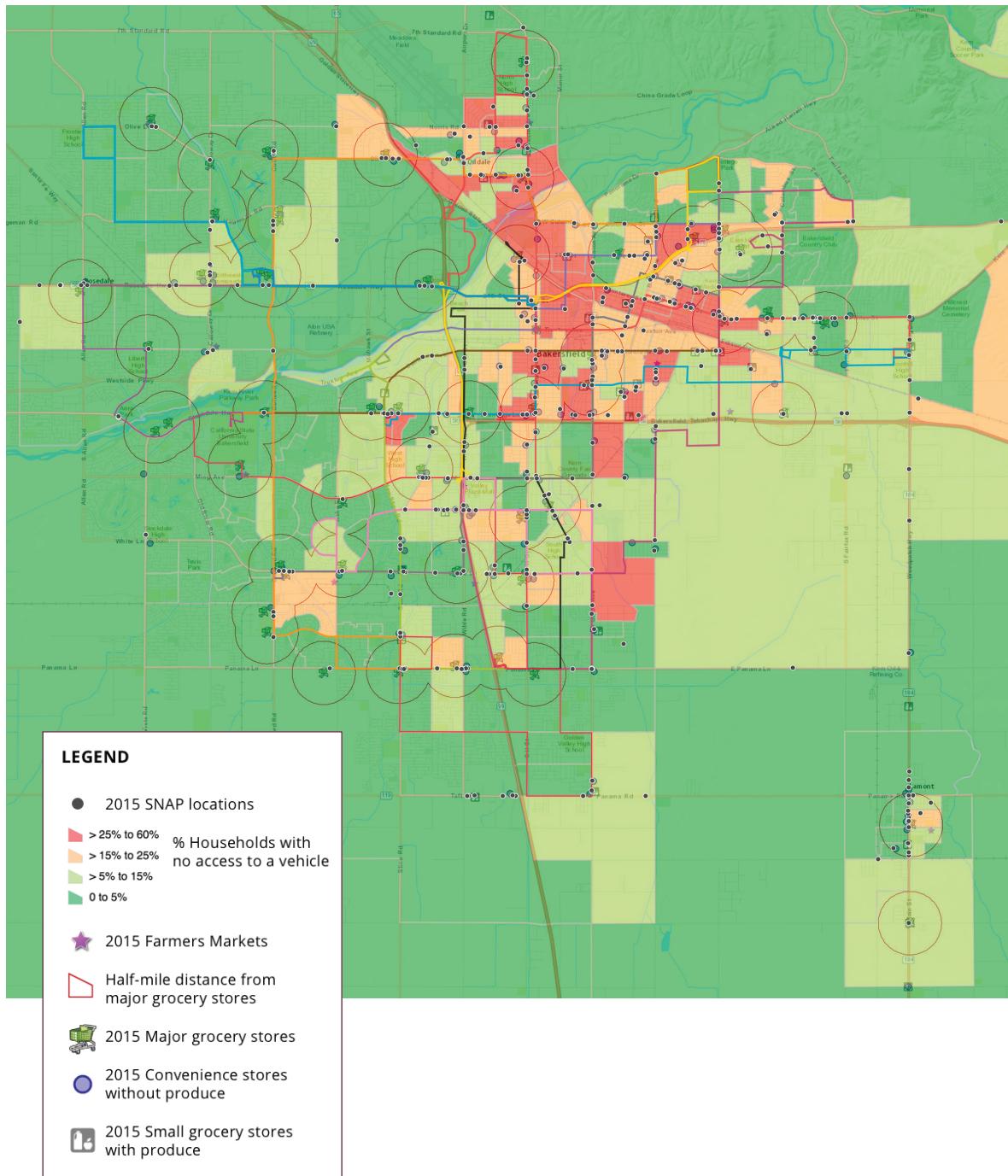
26 Southworth, M. (2005). Designing the walkable city. *Journal of urban planning and development*, 131(4), 246-257.

27 Bernhart, B. Community Action Partnership of Kern. www.capk.org

shows areas where households are less likely to have access to a vehicle and whether these areas have nearby public transportation. There are a few areas in which a higher than average percentage of residents do not have personal vehicles, few or no food outlets exist and there are no nearby public transportation lines.

Figure 18: Transportation and food access in Kern County

Source: Bernhart, B. Community Action Partnership of Kern. www.capk.org A larger, more detailed version of this map can be viewed here: <http://asi.ucdavis.edu/programs/sarep/research-initiatives/fs/assessment/bakersfieldmap/view>.



INDICATOR 2.2.4: Local produce donations in Kern County

Background

The donation of locally grown produce to emergency food distribution centers is one way to increase the accessibility of locally grown food to lower income community members who may not otherwise be able to afford it. Donated produce may come directly from a farm or farmers market, from grocery stores, or from gleaning projects where volunteers go to local farms to harvest donated crops.

Kern County Trends

For information regarding local produce donations in Kern County, see Vision 1, Goal 2, Indicator 3.

GOAL 2.3: The Kern County food system provides job opportunities

Background

One out of every three jobs in Kern County is in the food system, roughly double national and state averages. These jobs are in a wide range of industries, including farming and farm support services, food processing, food distribution, food service, and food retail.

Some of the most numerous food systems jobs both nationally and in Kern County are in food service, which is also one of the fastest growing sectors in the U.S. economy overall. The food service industry is expected to grow seven percent nationally from 2014 to 2024.²⁸ Crop production also provides a large percentage of the food systems jobs in Kern County.

Currently, there is no predetermined category for “food system related jobs” within the North American Industry Classification System (NAICS), which is utilized by the U.S. Bureau of Labor Statistics. Instead, job categories in the food system are layered under various NAICS codes. This report utilizes 32 NAICS codes that relate directly to production, distribution, and consumption activities within the food system. To see which industries were classified as food system related, along with their corresponding NAICS codes, please see Appendix B.

INDICATOR 2.3.1: Average wages in the Kern County food system

Kern County Trends

Figure 19 shows the ten food system job categories in Kern County with the highest total number of employees. These are the job categories that employ the most people in Kern County. The average annual wage in Kern County for each category is displayed along with state and national averages.

In 2014, average Kern County wages were lower than both California and national averages in six of these job categories: support activities for crop production, restaurants and other eating places, grocery stores, grocery and related product wholesalers, other food manufacturing,²⁹ and other crop farming.³⁰

In four of the ten job categories, Kern County wages were higher than both California and national averages: fruit and nut tree farming, vegetable and melon farming, cattle ranching and farming, and greenhouse and nursery.

28 Bureau of Labor Statistics. (2015). Occupational Outlook Handbook. www.bls.gov/ooh

29 Includes all miscellaneous manufactured foods that do not fit into another category—primarily snack foods, spices, and sauces. Includes nut roasting. Does NOT include manufacture of animal feed, dairy, meat, bread, pasta, vegetable, fruit, or sugar/confectionary products.

30 Includes all miscellaneous crops that do not fit into another category, including tobacco, cotton, sugarcane, hay, peanuts, etc. Does NOT include fruits, vegetables, livestock, or major commodity crops.

VISION 2: HEALTHY LOCAL FOOD ECONOMY

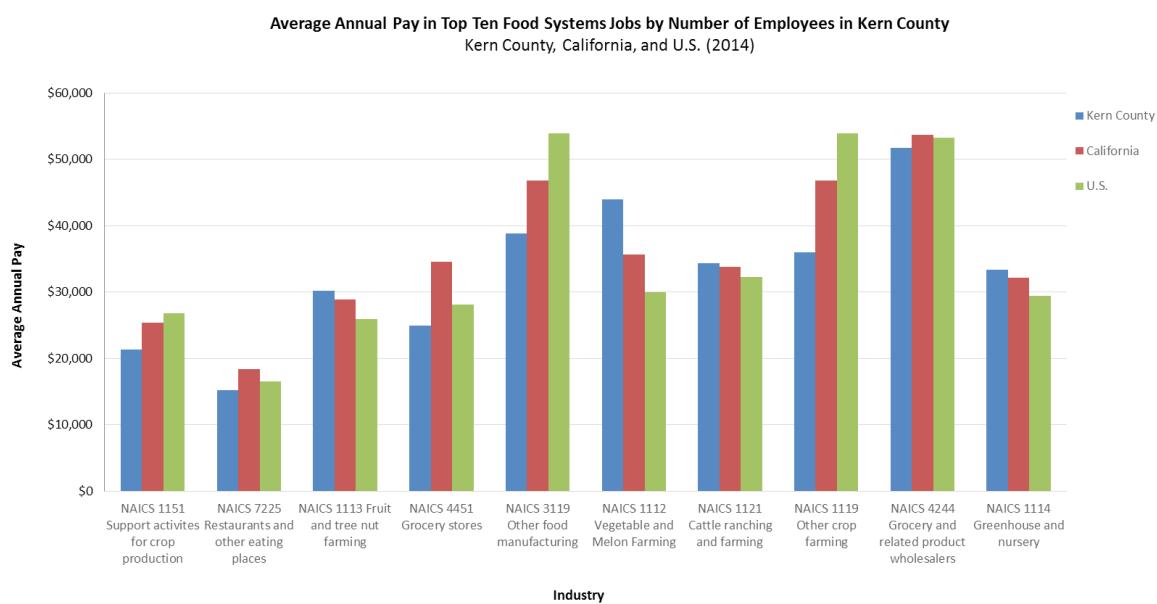


PHOTO CREDIT: GREG IGOR

Workers harvesting peppers in Kern County.

Figure 19. Average annual pay in ten food systems jobs with the highest number of employees³¹ in Kern County, California, and the United States (2014)

Source: U.S. Bureau of Labor Statistics Quarterly Census of Employment and Wages (QCEW)



³¹ "Top 10" based on ten food systems NAICS codes with the most workers in Kern County.

Figure 20 shows the ten food system job categories with the highest annual wages in Kern County in 2014.

The weighted average annual wage of the ten *highest paid* food system industry jobs in Kern County in 2014 was \$41,792.

The weighted average annual wage of *all* food system jobs in Kern County in 2014 was \$24,182.

Figure 20. Average annual wages of the ten highest paid food systems jobs in Kern County (2014)

Source: U.S. Bureau of Labor Statistics Quarterly Census of Employment and Wages (QCEW)

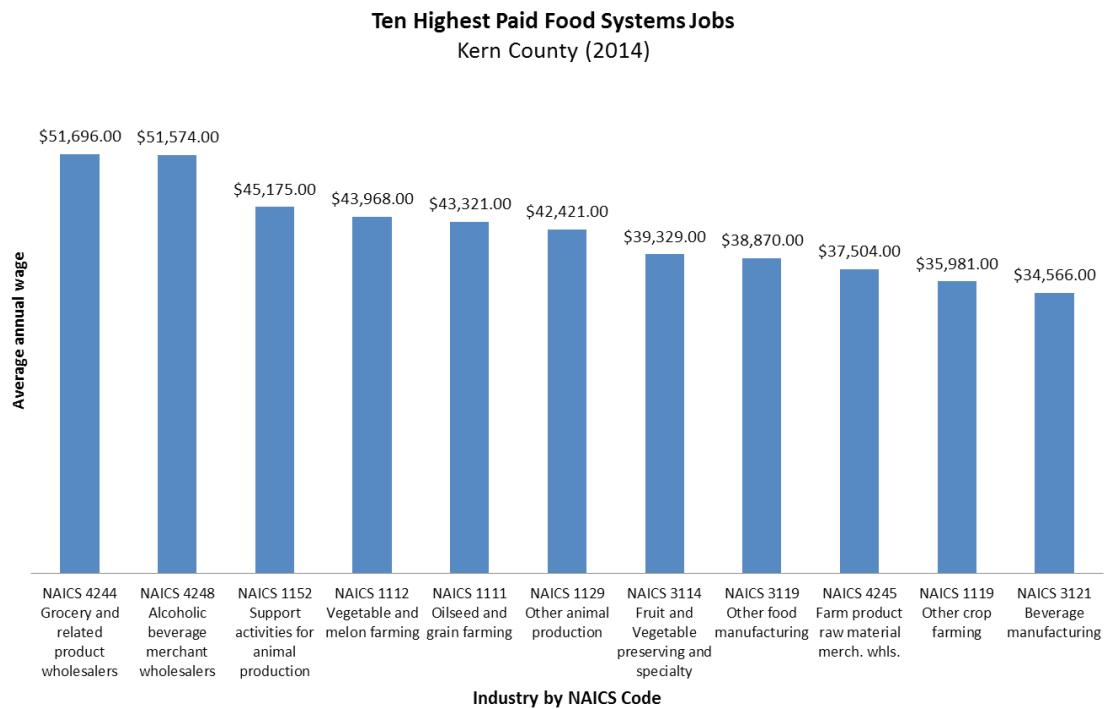
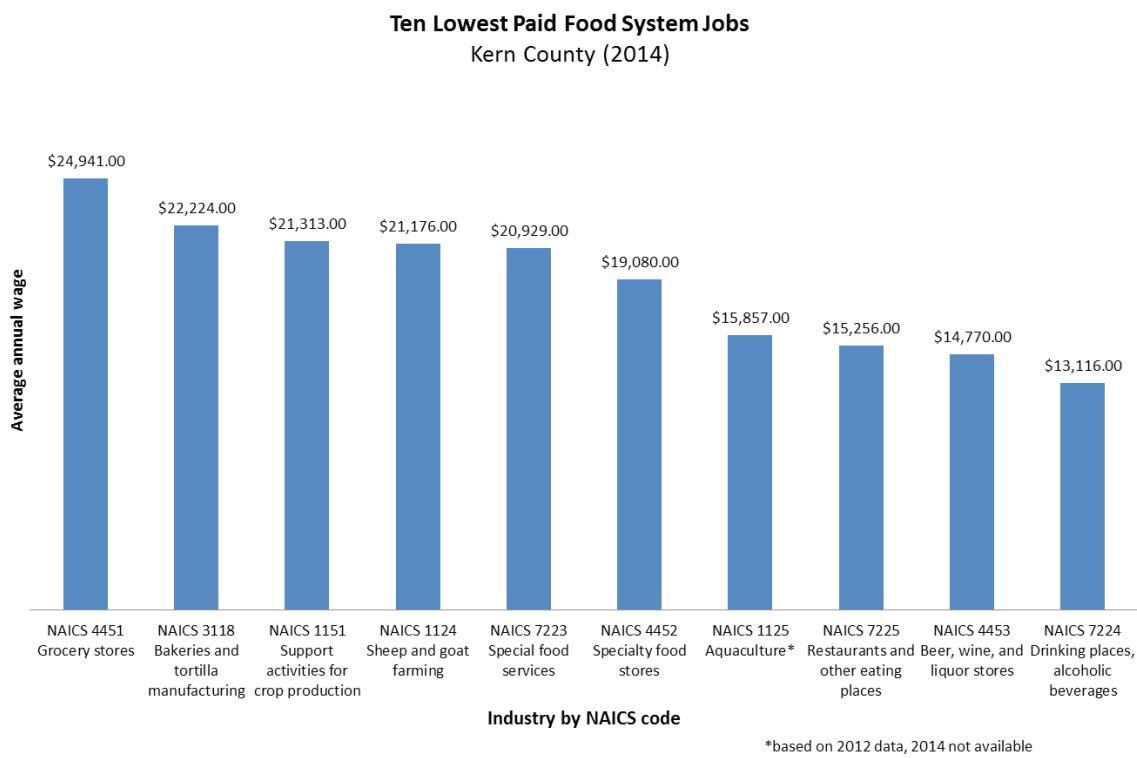


Figure 21 shows the food system job categories with the lowest average annual pay in Kern County in 2014. The weighted average annual wage of the ten *lowest paid* food system industry jobs in Kern County in 2014 was \$19,891.

Figure 21. Average annual wages of the ten lowest paid food systems jobs in Kern County (2014)³²
 Source: U.S. Bureau of Labor Statistics Quarterly Census of Employment and Wages (QCEW)



The Federal Poverty Level (FPL) for a household of four persons was \$23,850 in 2014. Of these ten job categories, only grocery store wages exceeded the FPL.

Table 6 shows the weighted annual average wages in the Kern County food system compared to the FPL.

Table 6: Weighted annual average wages in Kern County (2014)

Source: U.S. Bureau of Labor Statistics Quarterly Census of Employment and Wages (QCEW)

	Average annual wage in 2014
All food systems jobs	\$24,182
10 lowest paid food systems jobs	\$19,891
10 highest paid food systems jobs	\$41,792
All jobs (all industries, including food systems)	\$43,737
Federal poverty level for family of 4	\$23,850

³² Wages for NAICS 1151, Support Activities for Crop Production, may be less accurate than other job categories due to undercounting of agricultural workers in the QCEW, which leads to overestimating the pay per employee. For more details, see Martin, P. and Costa, D. (2017). Farmworker wages in California: Large gap between full-time equivalent and actual earnings. Economic Policy Institute, Working Economics Blog. Posted March 7, 2017. Retrieved May 10, 2017 from <http://www.epi.org/blog/farmworker-wages-in-california-large-gap-between-full-time-equivalent-and-actual-earnings/>



Harvesting carrots in Kern County.

PHOTO CREDIT: GREG IGOR

The Federal Poverty Level (FPL) is only one measure of poverty. The FPL was originally based on the USDA's Economy Food Plan, which did not assume a specific dollar amount for any budget category besides food.³³ Since that time, costs associated with other budget categories (housing, health care, child care, transportation, etc.) have risen much faster than the cost of food, and as a result many believe that the FPL underestimates current poverty levels.³⁴

Three alternate ways to measure poverty are the U.S. Census Bureau's Supplemental Poverty Measure (SPM), the Public Policy Institute of California and the Stanford University Center on Poverty and Inequality's California Poverty Measure (CPM), and the United Way's Real Cost Measure (RCM). All take into account additional budget categories beyond food, including differences in cost of living by region. The CPM also takes into account the role of California's social safety net in moderating poverty.³⁵

Measured according to the SPM, California has the highest poverty rate in the country at 20.6 percent (versus 15 percent using the FPL)³⁶ due to a high average cost of living. In Kern County, though poverty rates are high relative to the rest of the state, the lower cost of living results in a lower CPM (19.2 percent) relative to the FPL (24.4 percent).³⁷

The income needed by a family of four in Kern County to meet the Real Cost Measure (RCM), an estimated budget for all of a household's basic needs, is \$45,125, or almost double (194%) the FPL.³⁸

The average annual wages of workers in the two food systems jobs with the most employees in Kern County ("Support activities for crop production" and "Restaurant and other eating places") both fall below the FPL. Most other food systems jobs (see Table 6) likely fall below the RCM.

33 Fisher, G. (1997). The development and history of the U.S. poverty thresholds—a brief overview. *Newsletter of the Government Statistics Section and the Social Statistics Section of the American Statistical Association*. Department of Health and Human Services, pp. 6-7. Retrieved February 20, 2017, from <https://aspe.hhs.gov/history-poverty-thresholds>.

34 Block, B., Gascon, H., Manzo, P., & Parker, A. (2015). Struggling to Get By: The Real Cost Measure in California 2015. United Way of California. Retrieved May 12, 2017 from https://www.unitedwaysca.org/images/StrugglingToGetBy/Struggling_to_Get_By.pdf.

35 Bohn, S., Danielson, C., Levin, M., Mattingly, M., & Wimer, C. (2013). The California Poverty Measure: A New Look at the Social Safety Net. Public Policy Institute of California. Retrieved June 1, 2017 from http://www.ppic.org/content/pubs/report/R_1013SBR.pdf.

36 Three year average of 2013, 2014, and 2015. From Renwick, T., & Fox, L. (2016). The Supplemental Poverty Measure: 2015. *Current Population Reports, Series P60, 258*.

37 2011 rates. From Wimer, C., Mattingly, M., Levin, M., Danielson, C., & Bohn, S. (2013). A portrait of poverty within California counties and demographic groups. The Stanford Center on Poverty and Inequality.

38 Block, B., Gascon, H., Manzo, P., & Parker, A. (2015). Struggling to Get By: The Real Cost Measure in California 2015. United Way of California. Retrieved May 12, 2017 from https://www.unitedwaysca.org/images/StrugglingToGetBy/Struggling_to_Get_By.pdf.

INDICATOR 2.3.2: Number of jobs in the Kern County food system

Kern County Trends

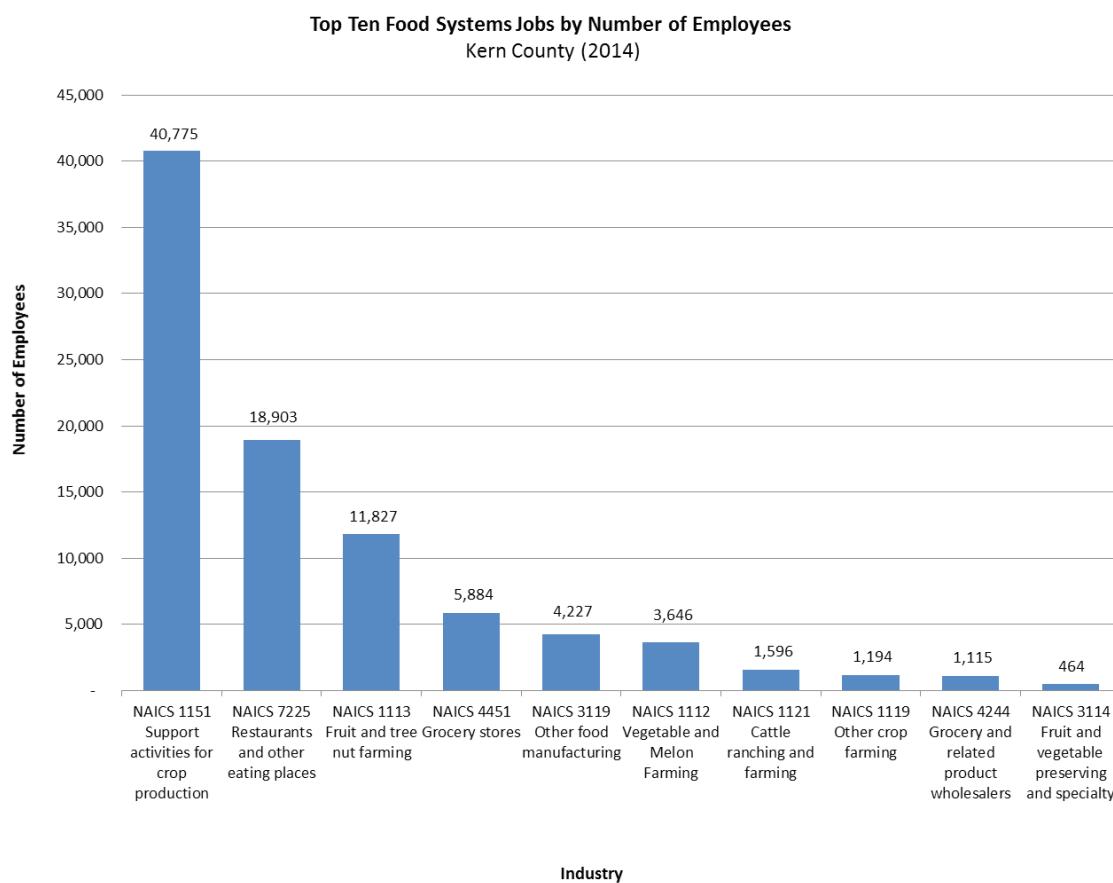
The total number of employees in the Kern County food system in 2014 was 91,696. Food system employees made up 29 percent of all employees in Kern County in 2014, double the national and state averages.

Figure 22 shows the ten job categories with the highest number of employees in Kern County in 2014. The job category with the most employees in 2014 was “support activities for crop production,” which includes farm labor and management. This industry had 40,775 total employees in 2014.³⁹ This accounts for almost half (44 percent) of the employees in Kern County’s food system.

The job category with the second highest number of employees in the food system in 2014 is was “restaurants and other eating places.” There were 18,880 employees in this category, accounting for 21 percent of all food system jobs.

Figure 22. Ten food systems jobs with the highest number of employees in Kern County (2014)

Source: U.S. Bureau of Labor Statistics Quarterly Census of Employment and Wages (QCEW)



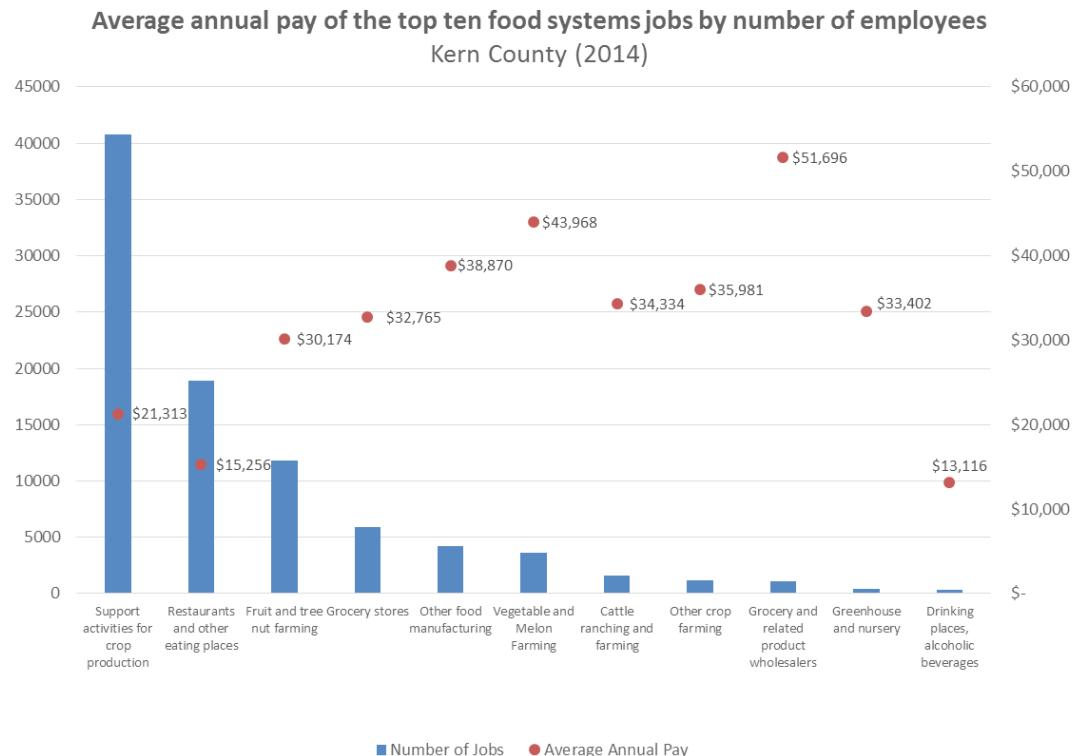
³⁹ NAICS 1151, Support Activities for Crop Production, is typically undercounted by the Bureau of Labor Statistics’ Quarterly Census of Employment and Wages (QCEW), so the actual number of agricultural workers in Kern County may be higher. For more details, see Martin, P. and Costa, D. (2017). Farmworker wages in California: Large gap between full-time equivalent and actual earnings. Economic Policy Institute, Working Economics Blog. Posted March 7, 2017. Retrieved May 10, 2017 from <http://www.epi.org/blog/farmworker-wages-in-california-large-gap-between-full-time-equivalent-and-actual-earnings/>

Figure 23 shows the number of employees in the food system in 2014 (represented by the blue bars and using the scale on the left), compared with average annual wages for those jobs (represented by the red dots and using the scale on the right).

This graph shows that the majority of employees in the food system are making less than \$30,000 annually, and there are many fewer employees in the jobs that have higher average annual wages.

Figure 23. Average annual pay of the ten food systems jobs in Kern County with the highest number of employees (2014)

Source: U.S. Bureau of Labor Statistics Quarterly Census of Employment and Wages (QCEW)



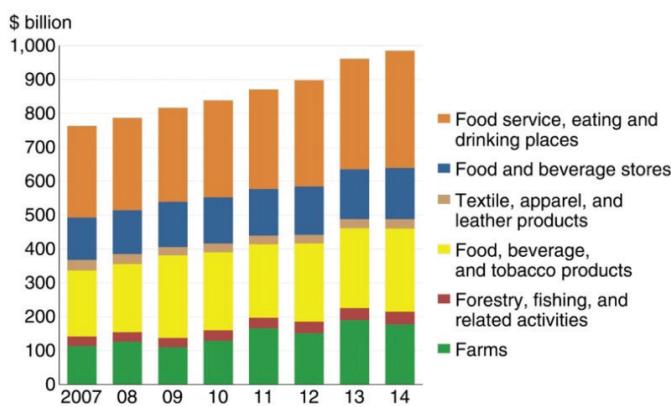


VISION 3: Healthy Farms and Environment

Background and National Trends

Agriculture is the backbone of the food system and is a major economic force in the United States. America's farms contributed \$177.2 billion to the U.S. economy in 2014. Agriculture and related industries account for a growing share of U.S. gross domestic product, up to 5.7 percent in 2014 (See Figure 24).¹ Food systems provide more jobs than any other U.S. industry, accounting for 14 percent of national employment and growing.²

Value added to GDP by agriculture and related industries, 2007-14



Note: GDP refers to gross domestic product.

Source: USDA, Economic Research Service using data from U.S. Department of Commerce, Bureau of Economic Analysis, Value Added by Industry series.

Figure 24: Value added to U.S. GDP by agriculture and related industries (2007–2014)

Source: USDA Economic Research Service.³

Nationally, the top crops grown in terms of value are corn, soy, wheat, and alfalfa.⁴ The U.S. is a net exporter of food, with approximately 20 percent of production exported each year, primarily to East Asia and North America. The majority of U.S. cotton, tree nuts, and rice are exported, as are approximately 50 percent of wheat and soybeans and 25 percent of fresh fruit. Approximately half of the fresh fruit and fruit juices and 20

1 USDA Economic Research Service. Selected Charts 2016, Ag and Food Statistics: Charting the Essentials. Retrieved March 16, 2017, from <https://www.ers.usda.gov/publications/pub-details/?pubid=80341>

2 Food Chain Workers Alliance and Solidarity Research Cooperative. (2016). No Piece of the Pie: U.S. Food Workers in 2016. Los Angeles, CA: Food Chain Workers Alliance.

3 USDA Economic Research Service. Selected Charts 2016, Ag and Food Statistics: Charting the Essentials. Retrieved March 16, 2017, from <https://www.ers.usda.gov/publications/pub-details/?pubid=80341>

4 USDA National Agricultural Statistics Service. (2014). USDA 2012 census of agriculture. Retrieved March 08, 2017, from agcensus.usda.gov.



Immature almonds, Kern County

PHOTO CREDIT: SUSAN REEP

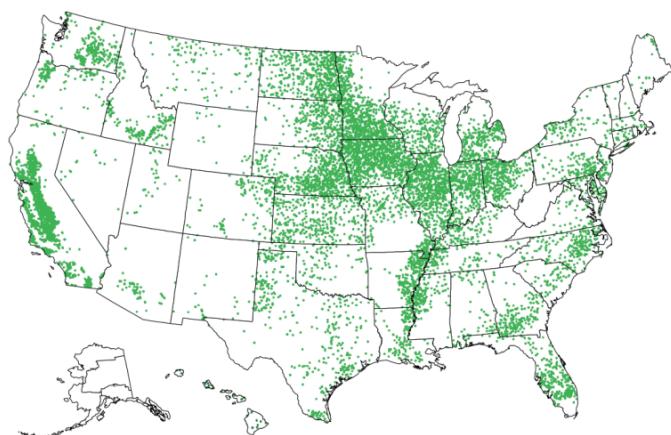
percent of the fresh vegetables consumed in the U.S. are imported from other countries.⁵

At a state level, the top five states in terms of value of crop sales (in order) are California, Iowa, Illinois, and Nebraska (see Figure 25).

Figure 25: Market value of crops sold in the United States (2012)

Source: USDA Economic Research Service.⁶

Market value of crops sold in 2012



1 dot = \$20 million

Source: USDA, Economic Research Service using data from USDA, National Agricultural Statistics Service, 2012 Census of Agriculture.

Agriculture is one of the most important industries in California. California's crop value of \$30 billion in 2012 was 75 percent higher than the crop value in Iowa, the second ranked state, due to its large and highly valued horticultural sector.⁷ By 2015, California's farms and ranches received about \$47 billion for their output, remaining the leading U.S. state in cash farm receipts.⁸

The agricultural sector employed almost 350,000 people in 2013 and the agricultural value chain accounts for nearly 3 million jobs in California.⁹

- 5 Exports expand the market for U.S. agricultural products. (n.d.). Retrieved March 15, 2017, from <https://www.ers.usda.gov/data-products/chart-gallery/gallery/chart-detail/?chartId=58396>
- 6 Crop production is concentrated in California and the Midwest. (n.d.). Retrieved March 15, 2017, from <https://www.ers.usda.gov/data-products/chart-gallery/gallery/chart-detail/?chartId=58320>
- 7 Crop production is concentrated in California and the Midwest. (n.d.). Retrieved March 15, 2017, from <https://www.ers.usda.gov/data-products/chart-gallery/gallery/chart-detail/?chartId=58320>
- 8 California Department of Food and Agriculture. (n.d.). California Department of Food and Agriculture 2015 Crop Year Report. Retrieved March 08, 2017, from <https://www.cdfa.ca.gov/statistics/>
- 9 Fast Facts on California's Agricultural Economy. Compiled by Assembly Committee on Jobs, Economic Development, and the Economy, Jose Medina, Chair. <http://ajed.assembly.ca.gov/sites/ajed.assembly.ca.gov/files/Fast%20Facts%20on%20California%27s%20Agricultural%20Economy.pdf>. Accessed April 1, 2017.

The U.S. agricultural sector has changed dramatically across the last century. The number of farms in the U.S. decreased from a peak of 7 million in 1935 to approximately 2 million today.¹⁰ Today's farms are larger than the farms of previous generations and increasing in average size and value each year. As the characteristics of the average farm have changed, the challenges facing the agriculture sector have shifted as well.

Although it has been enormously successful by many measures, the agriculture sector faces significant economic, social, and ecological challenges. Farmers across the country are aging, and rural landscapes are changing as farmland faces development pressure. Natural resources like water and soil are under stress in many regions, and changing markets, climate conditions, and regulations require farms to constantly innovate and adapt. Agricultural and other food systems workers also face challenges, from low wages and food insecurity to potentially hazardous working conditions.

Farms that are economically, socially, and ecologically sustainable will play a key role in meeting many of the challenges of the future—from supplying healthy food, to protecting natural resources, to fostering leadership and innovation. Farmers and food systems workers are on the frontlines of the food system, and will play a key role in meeting the challenges of maintaining a healthy food system into the future.

This section starts by looking at agricultural diversity both in terms of the characteristics of Kern County's farms (size, sales, types of crops) and of the people who operate these farms (age, race, gender, years farming). Next, it examines two common challenges in California agriculture—safe pest control and the protection of water quality. Last, it describes some of the challenges faced by food systems workers, with a particular focus on farmworkers.

Kern County Trends

Diversity

Agriculture in Kern County is highly diverse in terms of the range of foods produced. Top commodities include grapes, almonds, citrus, and milk. Large farms are common in Kern County, with an average farm size of more than 3 times the state or national average.¹¹

Like most of the country, farms in Kern County tend to be operated by individuals who are more likely to be older (average age 60), male (82 percent), and white (82 percent) as compared to the general population.¹² However, despite following these national trends in terms of how farm operators compare to local population demographics, because Kern County itself is exceptionally diverse, Kern County farmers are also more diverse than many other U.S. farming communities. At 18 percent, minority principal farm operators in Kern County are well over the national average of 4 percent, and female farm operators (also 18 percent in Kern County) are above the national average of 13 percent. The percent of women and minority farm operators is also growing, as is the case nationally as well.¹³

California is a top state nationally in terms of number of organic farms and total farm sales. Kern County led the state in organic sales in 2002, though the county's total organic sales have not grown at the same rate as the rest of California since that time, and decreased in 2012.¹⁴

Safe pest control

Managing pests is an important part of any farm operation, and farmers have a range of options at their disposal, including the use of pesticides. The use of lowest risk pesticides, including microbial

¹⁰ USDA Economic Research Service. Selected Charts 2016, Ag and Food Statistics: Charting the Essentials. Retrieved March 16, 2017, from <https://www.ers.usda.gov/publications/pub-details/?pubid=80341>

¹¹ USDA National Agricultural Statistics Service. (2014). USDA 2012 census of agriculture. Retrieved March 08, 2017, from agcensus.usda.gov.

¹² Ibid

¹³ Ibid

¹⁴ Ibid



PHOTO CREDIT: DOUG KESSLER

Almonds in bloom, Kern County.

and pheromone-based pesticides, has increased over the past 10 years, particularly in Kern County. The use of lower risk conventional pesticides has also increased in Kern County, with a corresponding decrease in the use of most higher risk pesticides. The exception to this trend is the use of higher risk fumigants, which has increased in both California and Kern County. Fumigants make up from 1/4 to 1/3 of total pounds of pesticides applied, due to their high rates (lbs/acre) of application. However, they make up only approximately 0.5 percent of total pesticide applications.¹⁵

Compliance rates with pesticide use regulations have increased since the early 2000s in Kern County, with current compliance levels remaining steady at between 88 and 93 percent compliance each year.¹⁶ The number of individuals impacted by reported pesticide drift incidents has also decreased from a high in the early 2000s.¹⁷

Water quality

Nitrate is both an important source of plant nutrients and one of the most common groundwater contaminants in the world. Nitrate is a water soluble form of nitrogen that can enter the water system through the use of nitrogen fertilizer and the disposal of animal waste. Nitrate is a regulated drinking water contaminant for which the maximum safe level of human consumption set by the U.S. Environmental Protection Agency is 45 mg/L. This is also known as the Maximum Contaminant Level, or MCL.

Surface water in Kern County, including native rivers and streams as well as water imported from other parts of the state, does not contain nitrate at levels of public health concern.¹⁸

Average groundwater levels of nitrate in Kern County are consistently below the MCL of 45 mg/L. However, individual samples did test above this level in Kern County in some years. In all cases where public drinking water systems exceeded the MCL for nitrate, the primary water source for that system was groundwater.¹⁹

15 California Department of Pesticide Regulation. (1990-2014). Annual Pesticide Use Reports. Retrieved from: <http://ziram.lawr.ucdavis.edu/PURwebGIS.html>

16 This data was provided in summary form by the Kern Co Ag Commissioner's office. It is available in more detail through the Pesticide Regulatory Activities Monthly Report (PRAMR) available at: <http://www.cdr.ca.gov/docs/enforce/report5.htm>.

17 California Department of Pesticide Regulation. (2000-2014).California Pesticide Illness Surveillance Program's California Pesticide Illness Query (CalPIQ). Retrieved from <http://apps.cdr.ca.gov/calpiq/>.

18 California Department of Water Resources. (1972-2012). Water Data Library. Retrieved from <http://www.water.ca.gov/waterdatalibrary/>.

19 United States Geological Survey. (1991-2014) National Water Information System (NWIS), queried via the Water Quality Portal (WQP), a collaborative tool of the National Water Quality Monitoring Council, the USGS, and the EPA. Retrieved from: <https://www.waterqualitydata.us/portal/>

The number of times per year that drinking water samples exceeded the recommended maximum level for nitrate in Kern County has increased, particularly over the past four years, though these samples still represent less than 10 percent of all samples tested. The public drinking water systems that exceeded the MCL for nitrate are typically small systems, and together they serve an average of 1083 individuals per year, less than half of one percent of the population of Kern County.²⁰

Farm worker health and safety

Food systems workers represent one out of every three workers in Kern County, which is more than double the national average. The majority of food systems workers in Kern County are farm workers and restaurant workers, two sectors with consistently low wages both locally and nationally. A higher percentage of California farmworkers are undocumented than the national average,²¹ which often results in lower wages and may make these workers particularly vulnerable to occupational hazards and labor violations.

In Kern County, the number of non-fatal occupational injuries reported among farmworkers has steadily decreased from a high of 19 in 2011 to zero the past two years (2015 and 2016). The number of fatal accidents among farmworkers ranged from 0 to 3 between 2002 and 2016 and shows no trend of increasing or decreasing over time.

The number of agriculture related pesticide illnesses reported in Kern County has decreased from a high in 2002.²² These illnesses are those reported by a physician, which are typically acute exposures experienced by farmworkers, though in some years they may include pesticide drift incidents that impacted residents not involved in farm work.

The majority of labor law violations in Kern County's food system involve farm labor contractors, with between zero and 10 cases handled by the U.S. Department of Labor each year. There does not appear to be a trend of increased or decreased cases over time.²³

GOAL 3.1: The farming sector in Kern County is diverse

Background

An ecosystem is a type of system that is made up of the interaction between both the living and the non-living things in an environment. Ecosystems that are diverse—those that include a wide range of different actors and processes—are typically also most resilient.²⁴ There are many types of ecosystems, including farms and food systems.

At the farm level, diversity may include growing and selling a mixture of crops, or hosting a broad range of beneficial insects and soil microorganisms.

A diverse food system, on the other hand, will include successful farms of many sizes growing many different crops, as well as farmers that reflect the racial, ethnic, and gender diversity of the local community.

Farms of different sizes serve different markets and make different contributions to local, national, and international economies. Farms that reflect the rich human diversity of California's Central Val-

20 U.S. Environmental Protection Agency. (2000-2014). Safe Drinking Water Information System (SDWIS). Retrieved from: <https://www3.epa.gov/enviro/facts/sdwis/search.html>.

21 National Agricultural Workers Survey. (2014). Table 1: National Demographic Characteristics, and Table 13: California Demographic Characteristics. Retrieved from <https://www.dolleta.gov/agworker/naws.cfm>.

22 California Department of Pesticide Regulation. (2000-2014). California Pesticide Illness Surveillance Program's California Pesticide Illness Query (CalPIQ). Retrieved from <http://apps.cdpr.ca.gov/calpiq/>.

23 U.S. Bureau of Labor Statistics. (2000-2014). Wage and Hour Division Enforcement Data for all zip codes in Kern County. Retrieved from <https://enforcedata.dol.gov/views/search.php>

24 Gunderson, L. H. (2000). Ecological resilience—in theory and application. *Annual review of ecology and systematics*, 31(1), 425-439.

ley²⁵ can provide a source of exchange, innovation, and creativity²⁶ that contribute to the health and resilience of the food system.

This section describes trends in Kern County agriculture related to diversity at the food system level, compared to trends in California and the U.S. when appropriate.

INDICATOR 3.1.1 Crop types in Kern County

Background

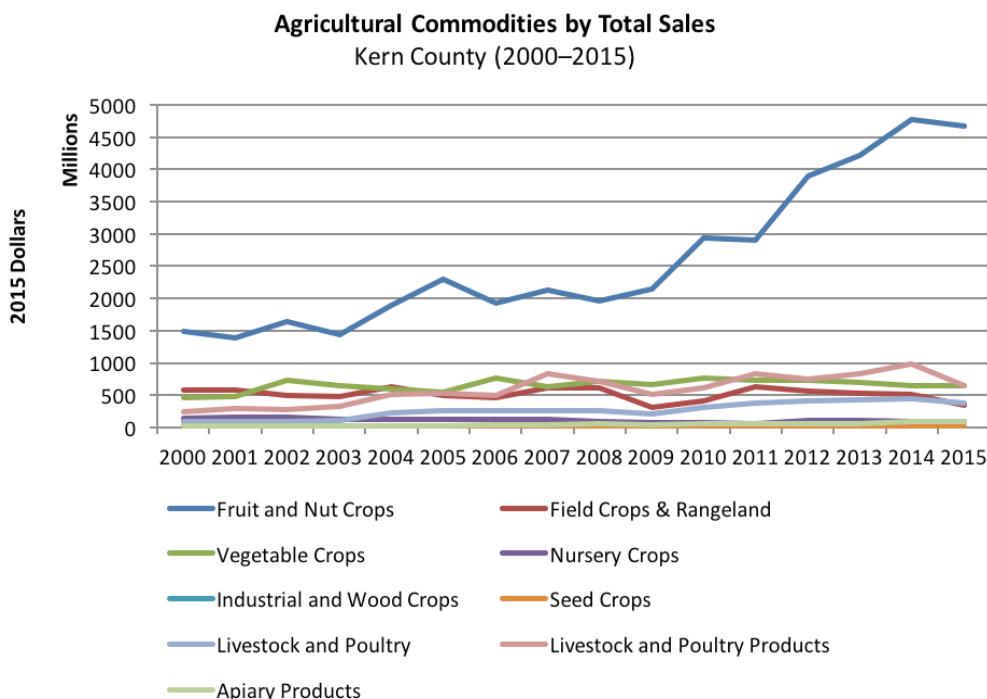
California's agriculture is one of the most diverse in the nation and the world.²⁷ California produced more than 400 commodities in 2015, including over one third of U.S. vegetables and two thirds of U.S. fruits and nuts.²⁸ California's top three commodities in 2015 in terms of sales were milk, almonds and grapes.

Kern County Trends

Kern County is one of the most productive agricultural counties in California. Figure 26 shows the value of agricultural sales by category from 2000–2015. The category with the highest value in terms of total sales is fruit and nut crops. These crops have experienced particularly high levels of growth over the past decade. The next highest categories in terms of sales are livestock and poultry products (including milk) and vegetable and field crops. Kern County also produces nursery crops, seed crops, wood crops and apiary products.

Figure 26: Kern County Agricultural Commodities Mix by Total Sales

Source: Kern County Agricultural Commissioners' Reports 2004–2015



25 Fujimoto, I. and Sandoval, G. 2007. Tapping into California's Central Valley's Hidden Wealth: Its Rich Cultural Capital. 9 Berkeley J. Afr.-Am. L. & Pol'y 119. Available at: <http://scholarship.law.berkeley.edu/bjlap/vol9/iss2/3>.

26 The United Nations Educational, Scientific and Cultural Organization. (2001). *Universal Declaration on Cultural Diversity*.

27 Qualset, C.O., McGuire, P.E. & Warburton, M. (1995). In California: 'Agrobiodiversity' key to agricultural productivity. *California Agriculture* 49(6): 45-49.

28 California Department of Food and Agriculture. (n.d.). California Department of Food and Agriculture 2015 Crop Year Report. Retrieved March 08, 2017, from <https://www.cdfa.ca.gov/statistics/>

Kern County's top 10 agricultural commodities in terms of sales are shown in Table 7. These top products account for more than 80 percent of all agricultural sales in a given year (82 percent in 2015). Although the top commodities vary slightly from year to year, grapes, almonds, and milk have consistently been in the top four for the past decade.

Table 7: Top Ten Agricultural Commodities in Kern County by Total Sales (2015)

Source: Kern County Agricultural Commissioner's Crop Report, 2015

Top 10 Agricultural Commodities by Total Sales	
Kern County (2015)	
1	Grapes
2	Almonds
3	Citrus
4	Milk
5	Cattle/calves
6	Carrots
7	Pistachios
8	Pomegranate
9	Alfalfa
10	Silage and Forage

Figure 27 shows all agricultural commodities that appeared in the top five in terms of sales at any point between 2000 and 2015. Grapes, almonds, milk, and citrus have all seen significant growth in Kern County over the past decade.

Figure 27: Top agricultural commodities in Kern County by total sales, 2000–2015

Source: Kern County Agricultural Commissioner's Crop Reports

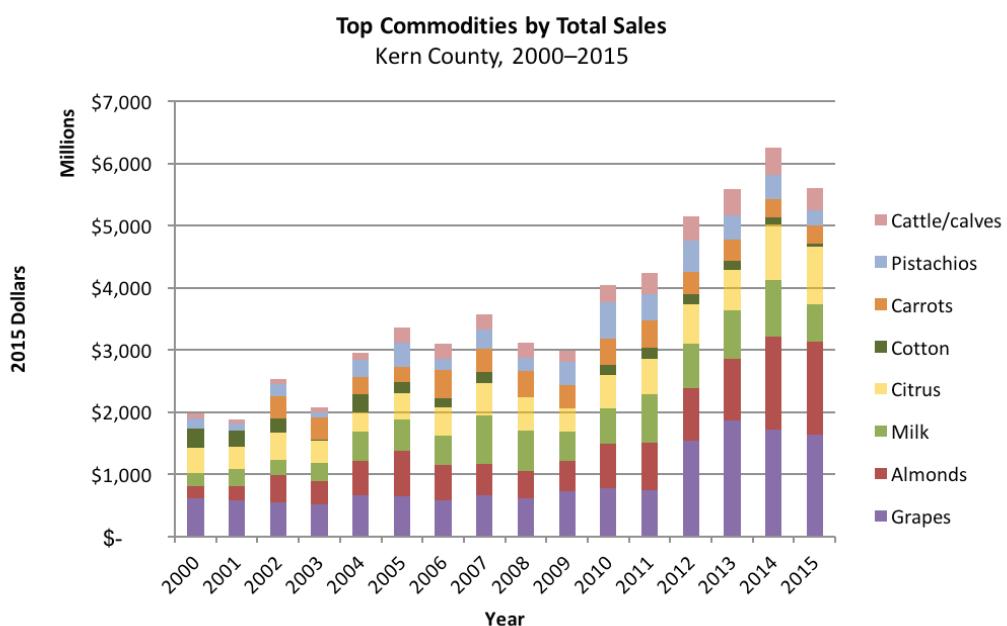


Figure 28 shows the geographic distribution of agricultural production across Kern County. This map is maintained by the Kern County Agricultural Commissioner's Office and is updated daily.

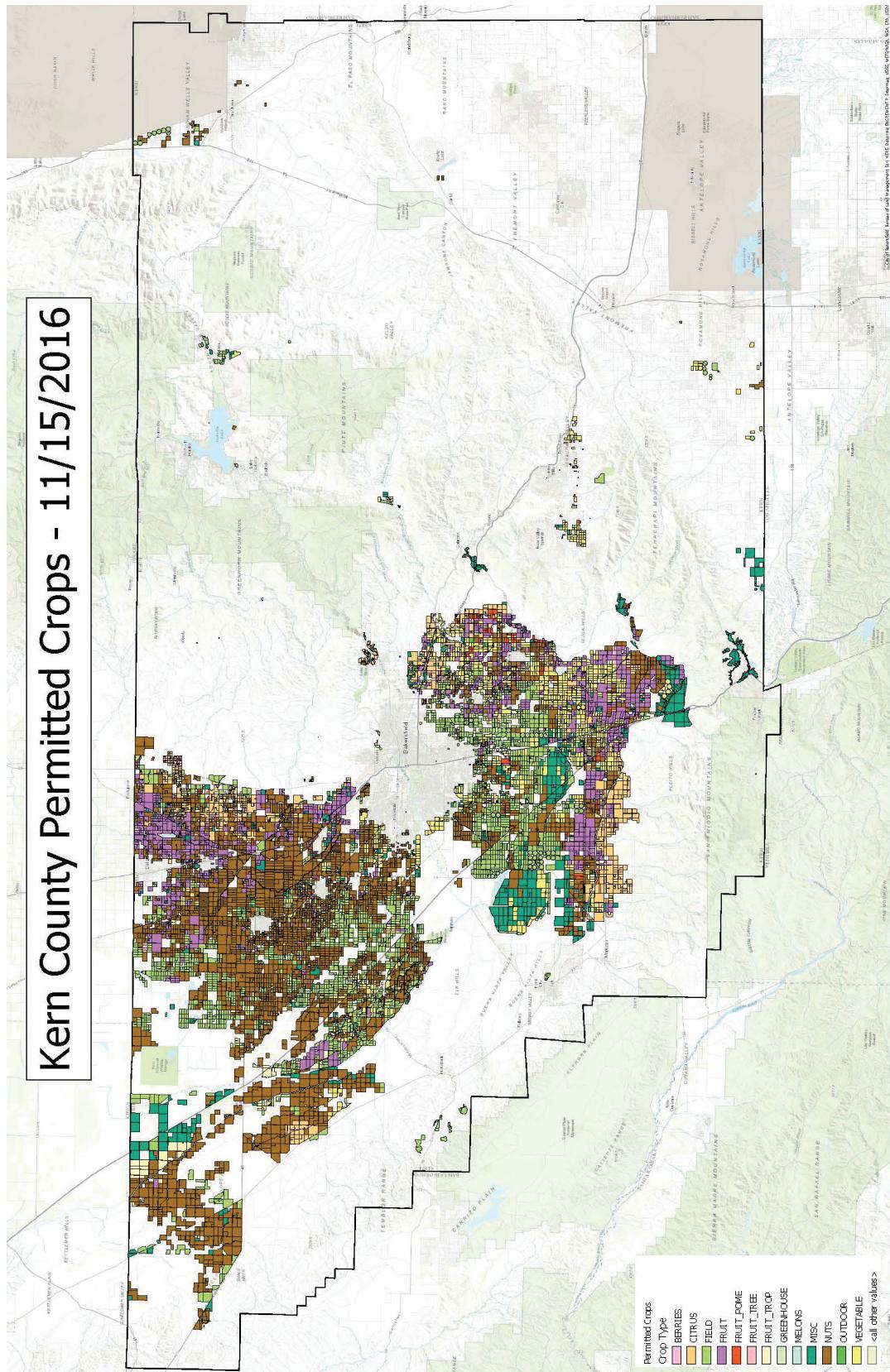


Figure 28: Kern County Crop Map (as of November 15, 2016)

Source: Kern County Agricultural Commissioner's Office. Current map: <http://www.kernag.com/cropmap/>

INDICATOR 3.1.2 Distribution of farm size

Background

The distribution of farms by size is another measure of the diversity of the agricultural sector. A diverse agricultural sector would include a mix of successful large, mid-scale and small farms, which generally serve different types of markets and impact the environment and rural communities in different ways.

This indicator describes the distribution of farms of different size categories in Kern County and compares this distribution to that of California. Farm size is measured both in acres and in value of sales.

Kern County Trends

Farm Size in Acres

Figures 29a and 29b show the percentage of farms in each size category (in acres) for Kern County and California from 1987 to 2012.

In Kern County (Figure 29a), farms are relatively evenly distributed across the size categories and this distribution has remained more or less stable over time. The average farm size in acres has decreased somewhat from 1,347 acres in 1987 to 1,202 acres in 2012.

Compared to California (Figure 29b), Kern County has a higher number of farms in the largest two acreage categories and a lower number of farms in the smallest two acreage categories. The average farm size in California is much smaller than in Kern County, at 368 acres in 1987 and 328 acres in 2012.

Figure 29a: Number of farms in Kern County by size in acres (1992-2012)

Source: USDA National Agricultural Statistics Service (NASS), Census of Agriculture (1992-2012)

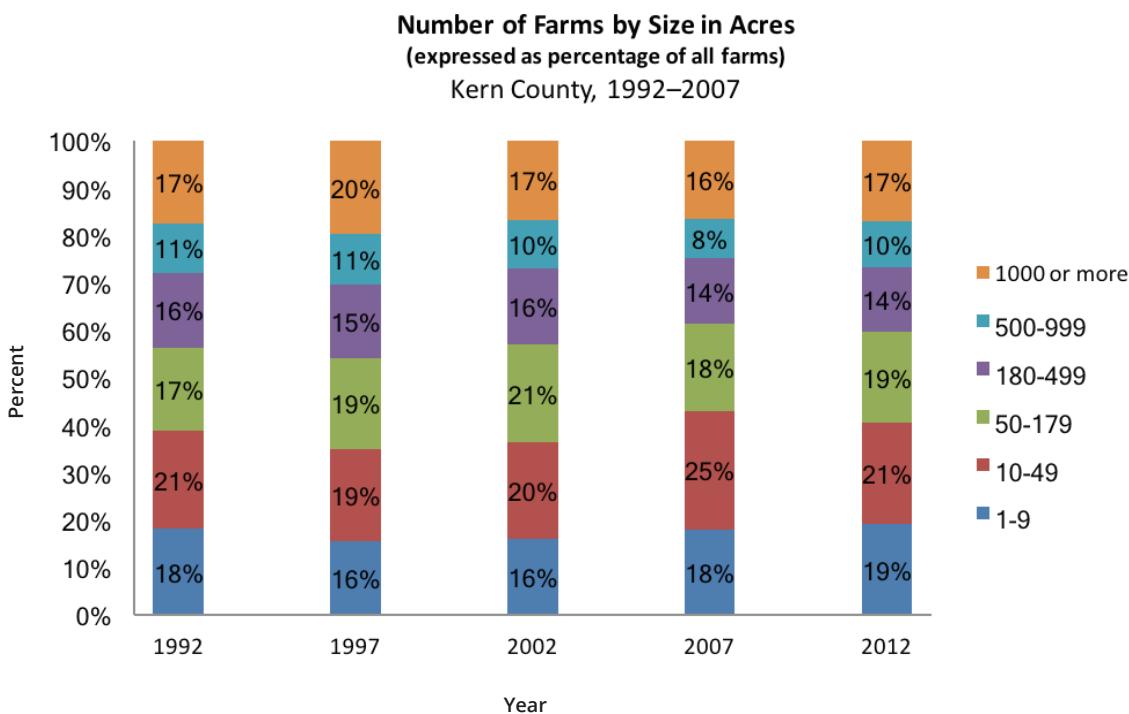


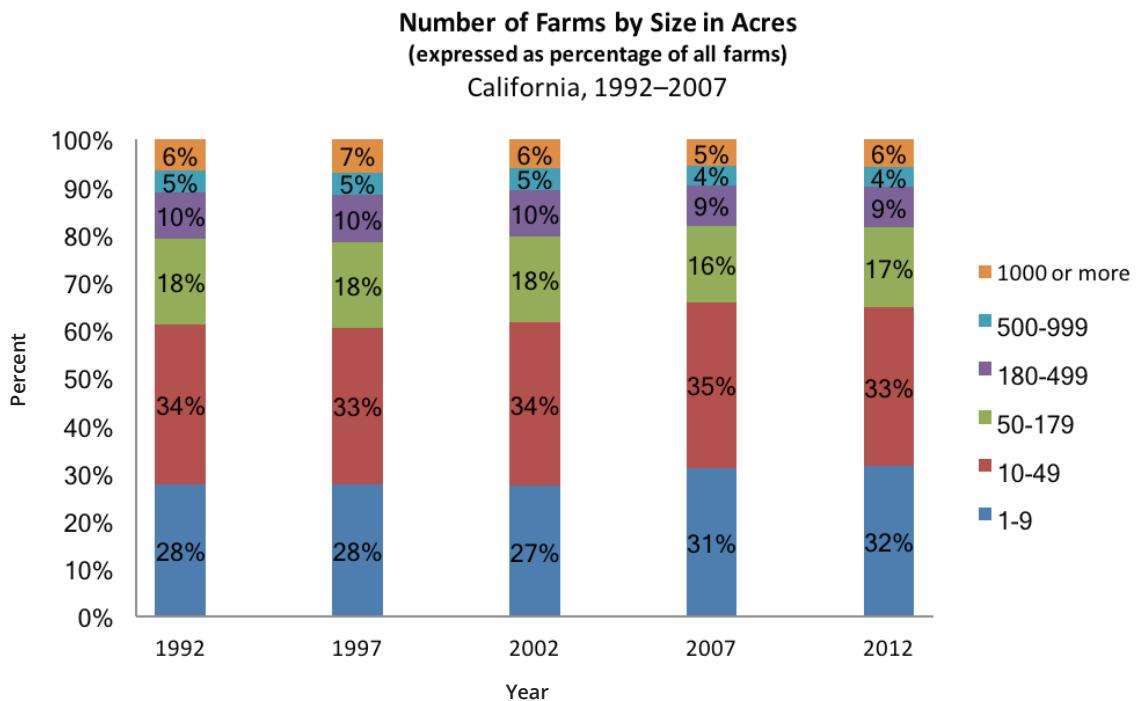


PHOTO CREDIT: DOUG KESSLER

Ewe with young lambs, Kern County.

Figure 29b: Number of farms in California by size in acres (1992-2012)

Source: USDA National Agricultural Statistics Service (NASS), Census of Agriculture (1992-2012)



Farm Size in Sales

Figures 30a and 30b show farm size distribution in Kern County and California, respectively, in terms of total sales per farm. Kern County has a higher percentage of farms with more than \$100,000 of sales than California as a whole (44 percent versus 26 percent in 2012), but has a very similar percentage of the smallest farm size of less than \$2,500 per year (27 percent versus 26 percent in 2012). Kern County has a lower relative number of farms in the middle categories (\$2,500-\$99,999 in annual sales).²⁹

29 The USDA definition of a small farm is gross sales of less than \$250,000, or less than \$350,000 after 2015. However, the largest farm size category in the USDA Census of Agriculture is \$100,000 or more, meaning this category encompasses both small, medium, and large farms by the USDA definition. This limits the usefulness of the available data to analyze farm size by total sales using USDA definitions.

Figure 30a: Number of farms in Kern County by total value of sales (1992–2012)

Source: USDA National Agricultural Statistics Service (NASS), Census of Agriculture (1992–2012)

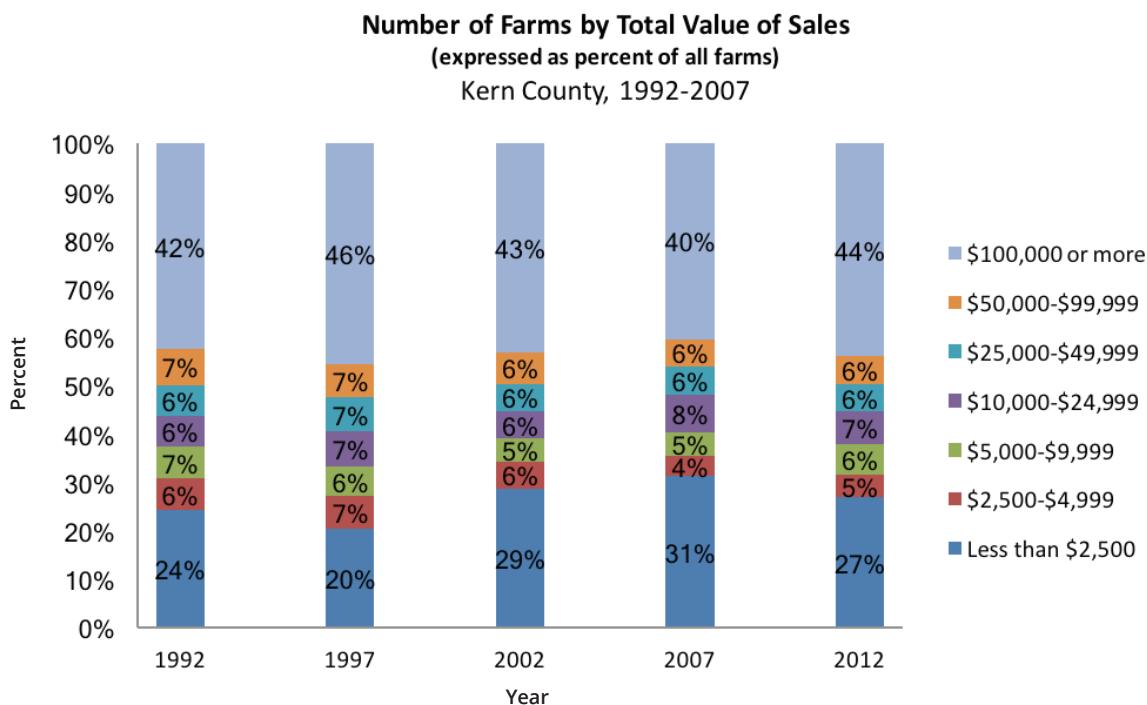
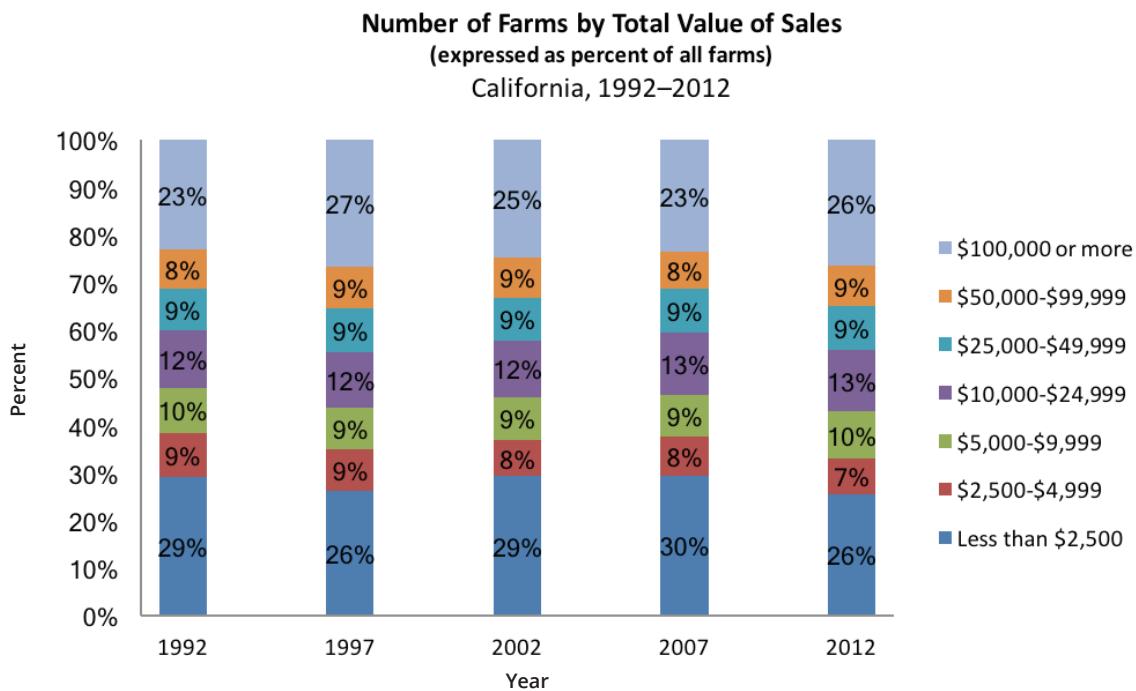


Figure 30b: Number of farms in California by total value of sales (1992–2012)

Source: USDA National Agricultural Statistics Service (NASS), Census of Agriculture (1992–2012)



The average market value per farm of products sold in Kern County increased from \$1.1 million in 1992 to \$2.1 million in 2012. The net cash farm income per farm increased from \$176,220 in 1992 to \$368,138 in 2012. In California, the average market value per farm increased from \$360,055 in 1992 to \$547,510 in 2012. The net cash farm income per farm increased from \$67,133 in 1992 to \$109,355

in 2012.³⁰ Both average market value per farm and net farm income per farm are much higher in Kern County than the California average.

INDICATOR 3.1.3 Average age of farmers

Background

The average age of farmers in the United States has been increasing for at least the last 40 years. This is in part due to the aging of existing farmers, and in part because many beginning farmers are starting their farming careers later in life. In 2012, 37 percent of beginning farmers were over 55, and only 19 percent were under 35.³¹

The average age of farmers in California and Kern County is also increasing, raising questions about what will happen to the agricultural sector, farmland resources, and rural communities as older farmers retire.

Kern County Trends

Figure 31 shows farmer age trends in Kern County and California from 2002 to 2012. The average age of farmers in Kern County increased from 56 years in 2002 to 59.7 years in 2012. In California, the average age increased from 56.8 years to 60.1 years.

Figure 31: Average age of principal farm operators in Kern County and California (2002–2012)

Source: USDA National Agricultural Statistics Service (NASS), Census of Agriculture (2002–2012)

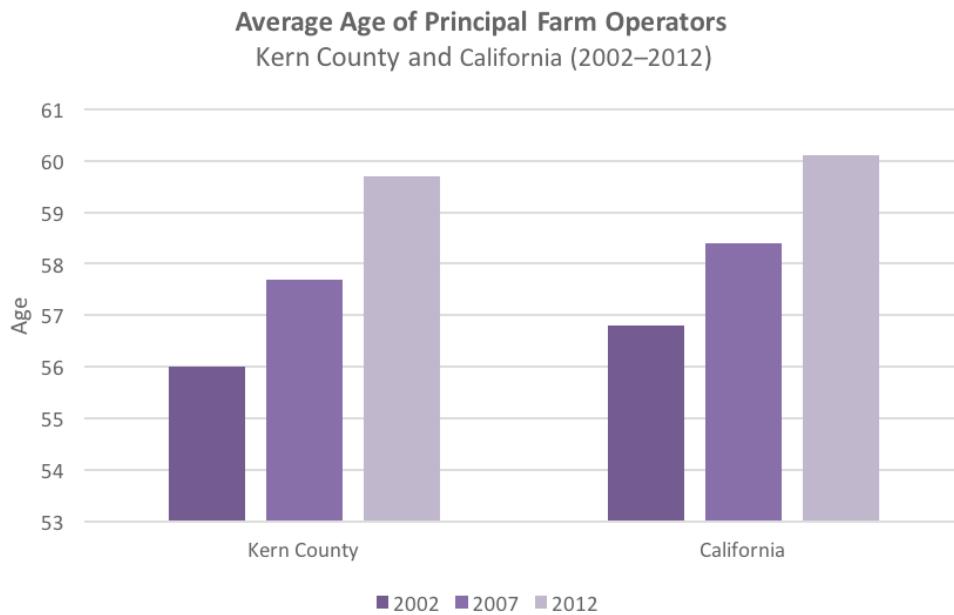


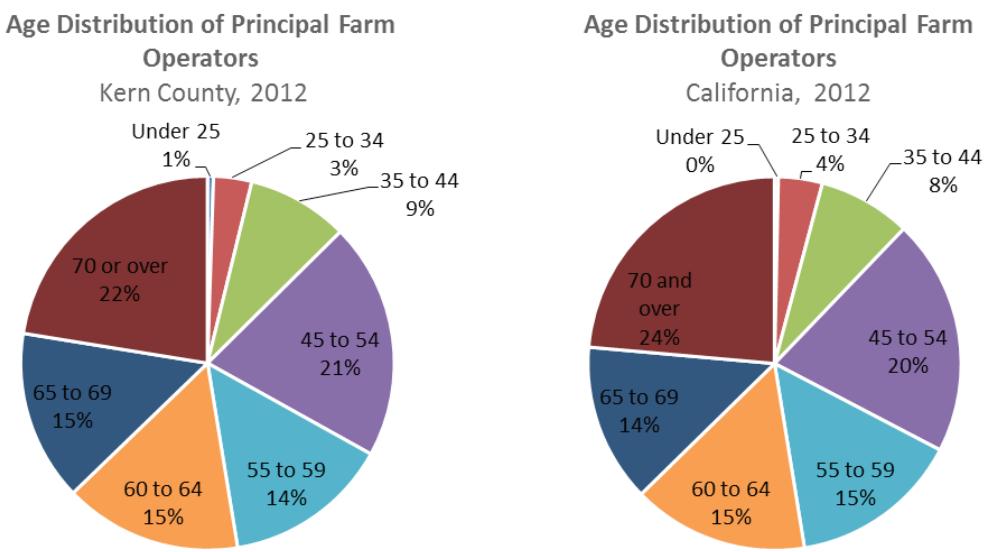
Figure 32 below shows the age distributions of principal operators in Kern County and in California in 2012. The smallest sliver in the pie chart at the top and the thin slice next to it to the right represent farmers under 25 and between 25 and 34, respectively. The largest slice represents farmers 70 and over (about 22 percent of all farmers). Farmers that are 55 and over represent about two thirds of all farmers in Kern County and California.

30 All adjusted for inflation to 2012 dollars

31 Katchova, A., & Ahearn, M. (2015). Farmland Assets and Growth Trends for Young and Beginning Farmers in the US. In *2015 Conference, August 9-14, 2015, Milan, Italy* (No. 211839). International Association of Agricultural Economists.

Figure 32: Age Distribution of Principal Farm Operators in Kern County and California (2012)

Source: USDA National Agricultural Statistics Service (NASS), Census of Agriculture (2012)



INDICATOR 3.1.4 Race of principal operator

Background

The U.S. is becoming more racially diverse over time, primarily due to an influx of new immigrants and their descendants.³² The current population of the U.S. is 62 percent white, 13 percent black, 6 percent Asian, 1.5 percent Native American,³³ 3 percent two or more races, and 18 percent Hispanic of any race.³⁴

The principal operators of farms in the U.S. are, however, overwhelmingly white. In 2012, farms with a white principal operator made up 96 percent of all farms, 98 percent of all agricultural sales dollars, and 94 percent of all acres farmed.³⁵

Though the number of farms operated by racial minorities in the U.S. is small, it is growing. In 2012, minority-operated farms made up four percent of all farms. This represents an increase from the previous Census of Agriculture in 2007. In 2012, there were 21 percent more Hispanic- and Asian-operated farms and 12 percent more black-operated farms than in 2007. However, the number of minority-operated farms is still small compared to the overall population demographics of the U.S. Sales for minority farms are generally lower compared to all farms, with the exception of Asian-operated farms (see Table 8).

³² Pew Research Center. U.S. Population Projections 2005–2050. Retrieved March 16, 2017, from <http://assets.pewresearch.org/wp-content/uploads/sites/3/2010/10/85.pdf>

³³ American Indian, Native Alaskan, Native Hawaiian, and Other Pacific Islander. US Census 2015.

³⁴ USDA National Agricultural Statistics Service. (2014). USDA 2012 census of agriculture. Retrieved March 08, 2017, from agcensus.usda.gov.

³⁵ Ibid.

Table 8: Total agricultural sales by minority-operated farms in the U.S. in 2012

Source: USDA National Agricultural Statistics Service (NASS), Census of Agriculture (2012)

	Total sales < \$10,000/year	Total sales > \$100,000/year
All farms	57%	18%
Hispanic-operated	68%	10%
Native American-operated	78%	5%
Black-operated	79%	3%
Asian-operated	43%	27%

Kern County Trends.

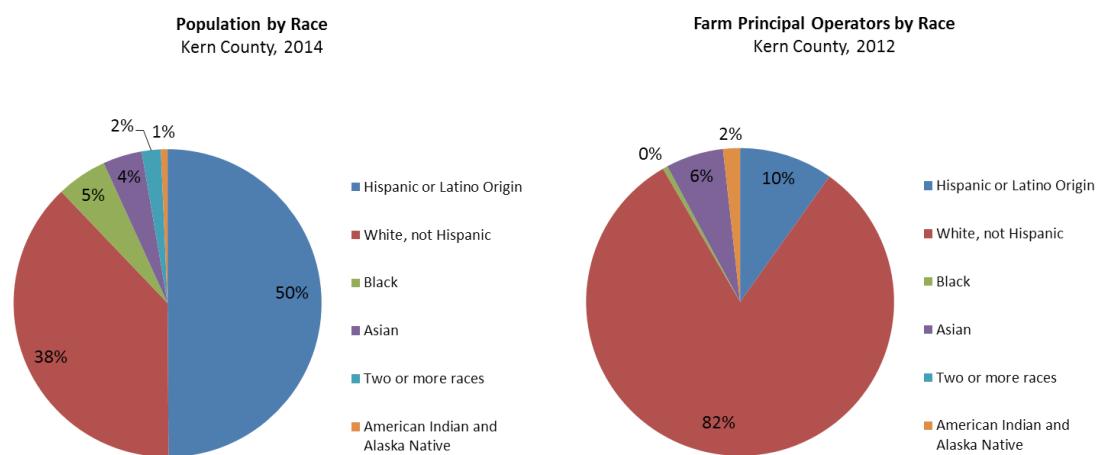
Kern County is unusual relative to the most of the U.S. in that the majority of the population is made up of groups that are racial minorities at the national level. As shown in Figure 33, the general population of Kern County is approximately 50 percent Hispanic, 38 percent white, 5 percent black, 4 percent Asian, 2 percent two or more races, and 1 percent Native American. In this way it closely mirrors the projected future population of the U.S.³⁶

Farm principal operators in Kern County are also more diverse than the national average, though minority-operated farms are still underrepresented relative to their share of the population. Figure 33 shows that farm principal operators in Kern County are 82 percent white, 10 percent Hispanic, and 6 percent Asian. All other races make up less than 1 percent each.

Figure 33: Racial demographics of Kern County (2014) and Kern County principal farm operators (2012)

Source for population by race: US Census American Communities Survey (2014)³⁷

Source for farm principal operators by race: USDA National Agricultural Statistics Service (NASS), Census of Agriculture (2012)



36 Pew Research Center. U.S. Population Projections 2005–2050. Retrieved March 16, 2017, from <http://assets.pewresearch.org/wp-content/uploads/sites/3/2010/10/85.pdf>

37 U.S. Census Bureau. (2014). 2014 American Community Survey. State and county quick facts: Kern County. Retrieved February 22, 2016, from <http://www.census.gov/quickfacts/table/RHI825214/06029,001>.

Figures 34a and 34b show changes to the racial demographics of farm principal operators in Kern County and California over the past decade. The overall number of white principal operators declined in both Kern County and California, while Asian principal operators increased. The number of Hispanic principal operators increased in California and stayed relatively stable in Kern County.

Figure 34a: Principal Farm Operators by Race, Kern County, 2002–2012

Source: USDA National Agricultural Statistics Service (NASS), Census of Agriculture (2002–2012)

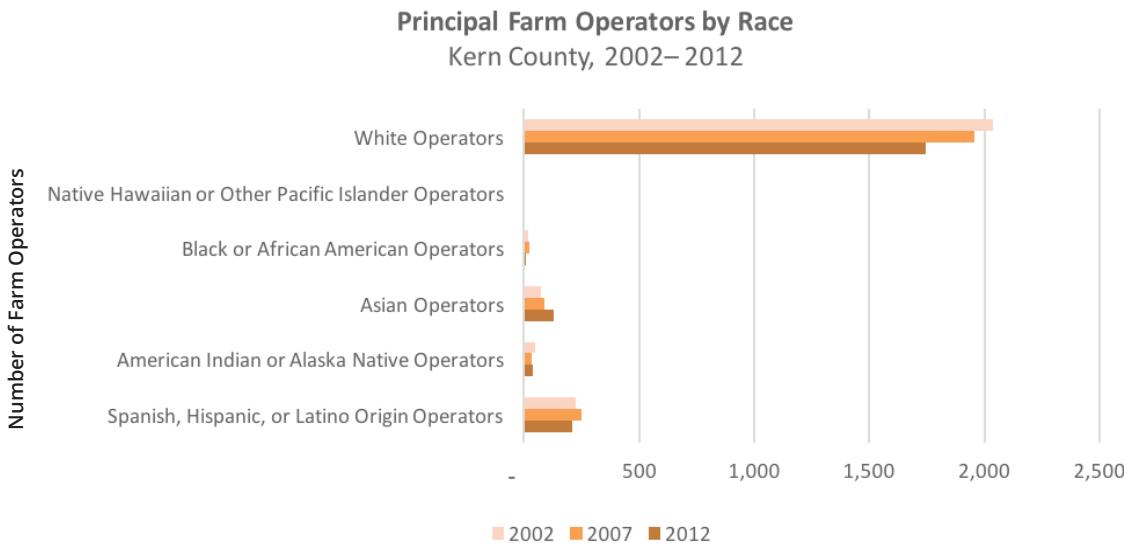
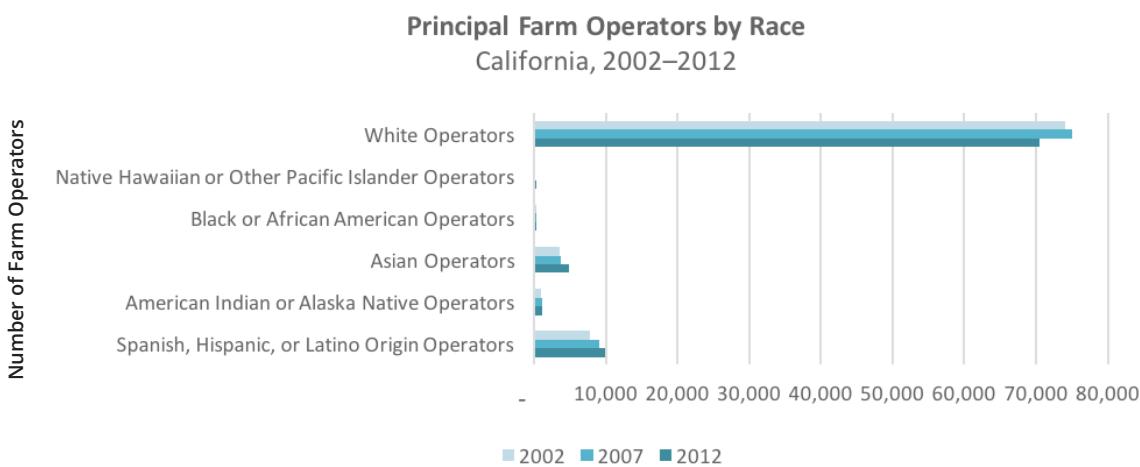


Figure 34b: Principal Farm Operators by Race, California, 2002–2012

Source: USDA National Agricultural Statistics Service (NASS), Census of Agriculture (2002–2012)



INDICATOR 3.1.5 Tenure on farm

Background

Almost 10 percent of farmland in the U.S. is expected change hands over the next five years as older farmers retire, and 70 percent will likely change hands in the next 20 years.³⁸ Whether this land stays in farming or is converted to other types of development will impact rural communities across the country.

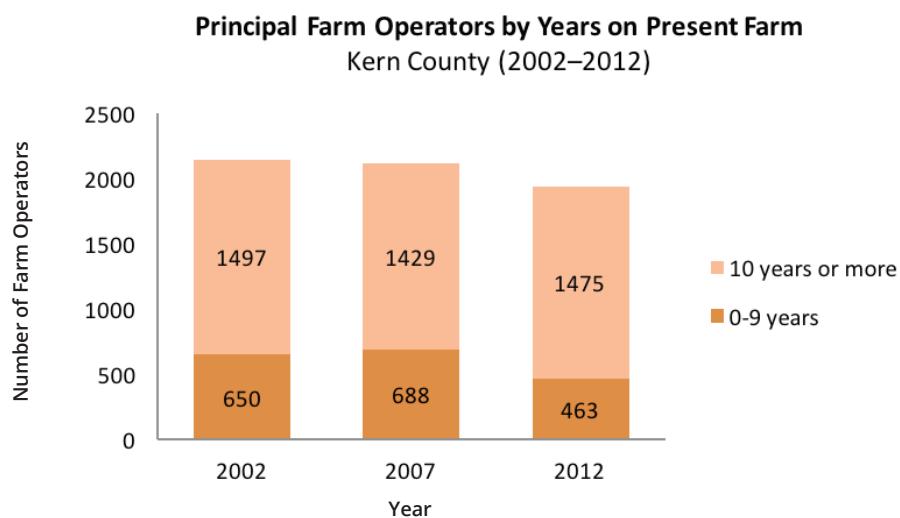
The USDA has provided special supports for beginning farmers for more than 20 years,³⁹ including technical assistance and assistance accessing land, capital, and markets.⁴⁰ Beginning farmers and ranchers are defined by the USDA as those who have been farming for less than 10 years.

Kern County Trends

Approximately one third of all farmers in Kern County in 2002 and 2007 had been farming for less than 10 years on their present farm (see Figure 35a). However, by 2012, the percentage of beginning farmers had dropped to 24 percent. The average number of years on the present farm has increased steadily from 2002 (15.8 years) to 2012 (20.9 years).

Figure 35a: Number of principal farm operators in Kern County by tenure on present farm (2002–2012)

Source: USDA National Agricultural Statistics Service (NASS), Census of Agriculture (2002-2012)



These trends are very similar to California (Figure 35b) in which the percentage of beginning farmers decreased significantly from around 30 percent in 2002 and 2007 to 26 percent in 2012. This is slightly higher than the percentage of beginning farmers in Kern County in 2012 (24 percent). Average years on present farm also increased in California from 18.3 years in 2002 to 20.1 years in 2012.

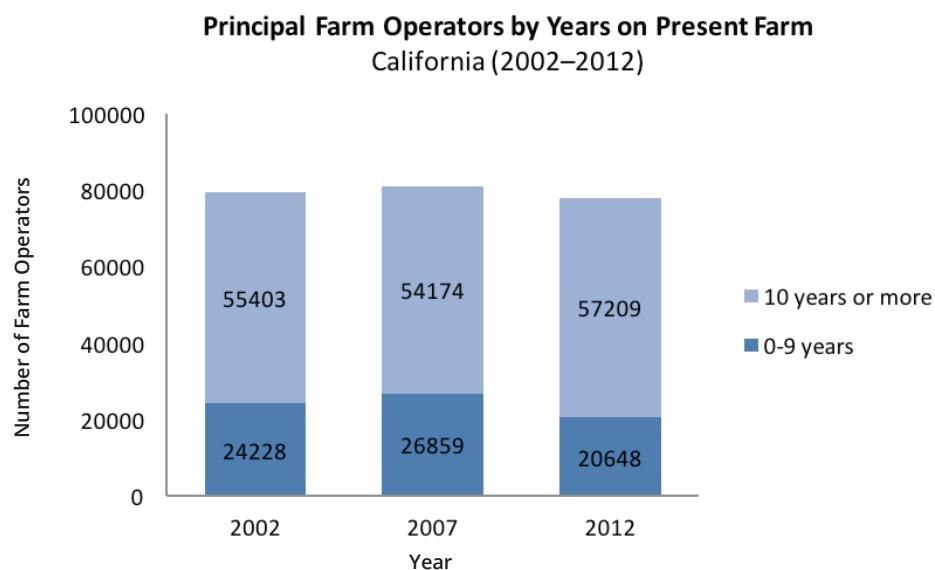
38 Parsons, R., Ruhf, K., Stevenson, G. W., Baker, J., Bell, M., Epley, E., & Keller, J. (2010). Research report and recommendations from the FarmLASTS Project. Retrieved March 16, 2017, from <http://www.uvm.edu/farmlasts/FarmLASTSResearchReport.pdf>; USDA. 2016. *USDA Results: Beginning Farmers and Ranchers*. Retrieved January 22, 2017, from <https://nifa.usda.gov/program/beginning-farmer-and-rancher-development-program-bfrdp>

39 Beginning with the 1992 Agricultural Credit Improvement Act and expanding in 2008 and 2014. From Katchova, A., & Ahearn, M. (2015). Farmland Assets and Growth Trends for Young and Beginning Farmers in the US. In *2015 Conference, August 9-14, 2015, Milan, Italy* (No. 211839). International Association of Agricultural Economists.

40 USDA. 2016. *USDA Results: Beginning Farmers and Ranchers*. Retrieved January 22, 2017, from <https://nifa.usda.gov/program/beginning-farmer-and-rancher-development-program-bfrdp>

Figure 35b: Number of principal farm operators in California by tenure on present farm (2002–2012)

Source: USDA National Agricultural Statistics Service (NASS), Census of Agriculture (2002-2012)



INDICATOR 3.1.6 Percentage of women farm operators

Background

Women make up approximately half the population of the U.S., and represent a small but growing number of principal farm operators. Women principal farm operators have increased from about 5 percent of all principal farm operators in 1982 to 13 percent in 2012. However, these small percentages may be misleading. When accounting for all farm operators (not only principal farm operators), women make up 31 percent of all farmers in the U.S. and 33 percent of all farmers in California. In addition, women have always been involved in a wide range of support activities for agriculture, including household work, on-farm work, and various forms of off-farm work that helps keep farms viable.⁴¹ The USDA Census of Agriculture only counts one principal farm operator per farm, so women may be underrepresented in official statistics if they are part of a farm family that also includes a male farmer.

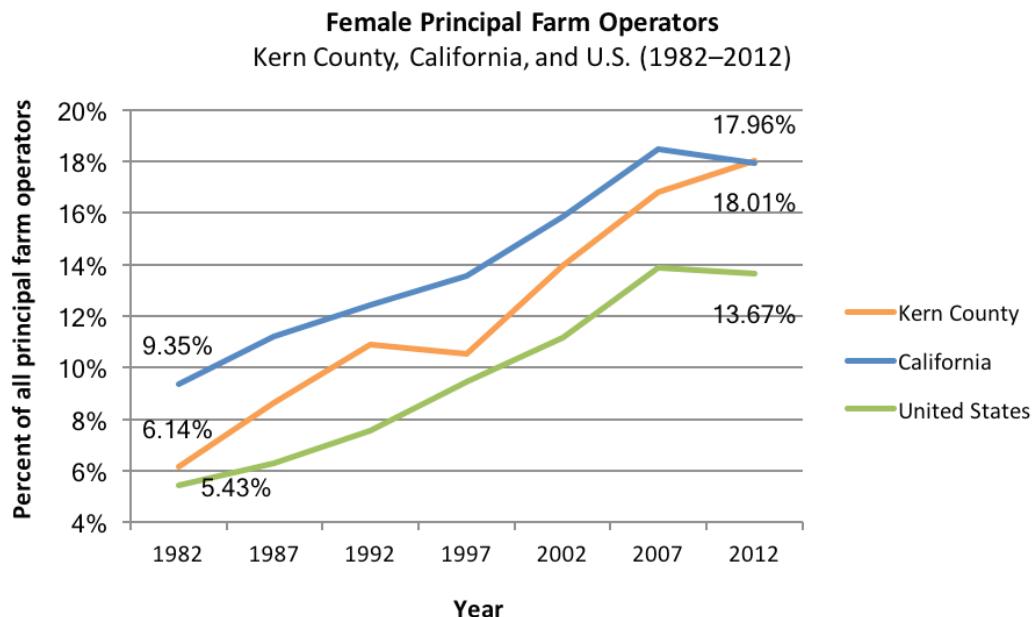
Kern County Trends

Kern County has had a higher percentage of female principal operators than both California and the U.S. since 1982 and continuing through 2012. Figure 36 shows the percentage of female principal farm operators in Kern County, California, and the U.S.

⁴¹ Lobao, L., & Meyer, K. (2001). The great agricultural transition: Crisis, change, and social consequences of twentieth century US farming. *Annual review of sociology*, 27(1), 103-124.

Figure 36: Percentage of female principal farm operators in Kern County, California and the U.S. (1982–2012)

Source: USDA National Agricultural Statistics Service (NASS), Census of Agriculture (1982-2012)



INDICATOR 3.1.7. Number of certified organic farms

Background

The National Organic Program (NOP) of the USDA was established by the 1990 National Organic Foods Act, and has the authority to develop and enforce rules and regulations on agricultural products labeled as “organic” within the U.S.

The USDA defines organic agriculture as:

the application of a set of cultural, biological, and mechanical practices that support the cycling of on-farm resources, promote ecological balance, and conserve biodiversity. These include maintaining or enhancing soil and water quality; conserving wetlands, woodlands, and wildlife; and avoiding use of synthetic fertilizers, sewage sludge, irradiation, and genetic engineering.⁴²

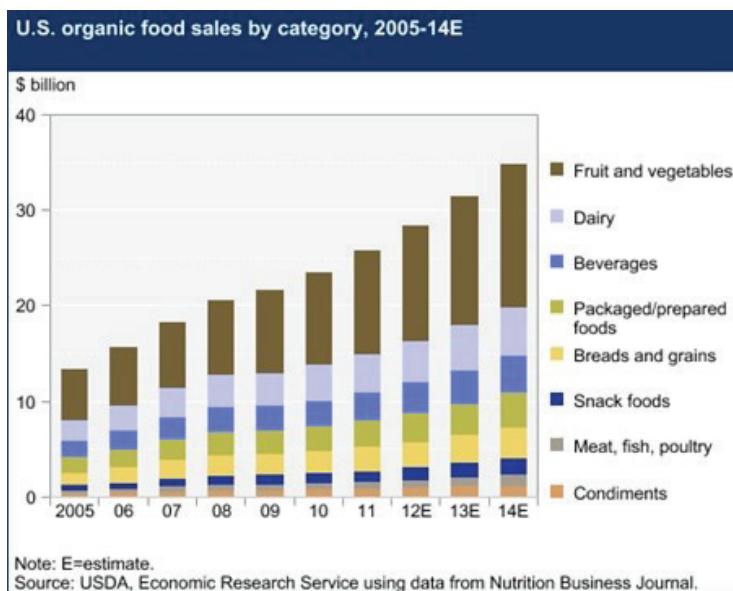
Consumer demand for organically produced goods has increased dramatically in the last few decades, showing double-digit growth during most years since the 1990s.⁴³ Total sales of organic products were estimated at \$28.4 billion in 2012 and \$35 billion in 2014. Organic sales account for more than 4 percent of total U.S. food sales. This demand has provided market incentives for farmers in many product categories, particularly fruits and vegetables, the largest organic segment in organic food sales (Figure 37).

⁴² USDA Agricultural Marketing Service. (2015). Introduction to Organic Practices. Retrieved March 16, 2017, from <https://www.ams.usda.gov/publications/content/introduction-organic-practices>

⁴³ USDA Economic Research Service. (2016). Organic Agriculture. Overview. Retrieved January 22, 2017, from <https://www.ers.usda.gov/topics/natural-resources-environment/organic-agriculture/>

Figure 37: U.S. Organic Food Sales by Category (2005-2014)

Source: USDA Economic Research Service

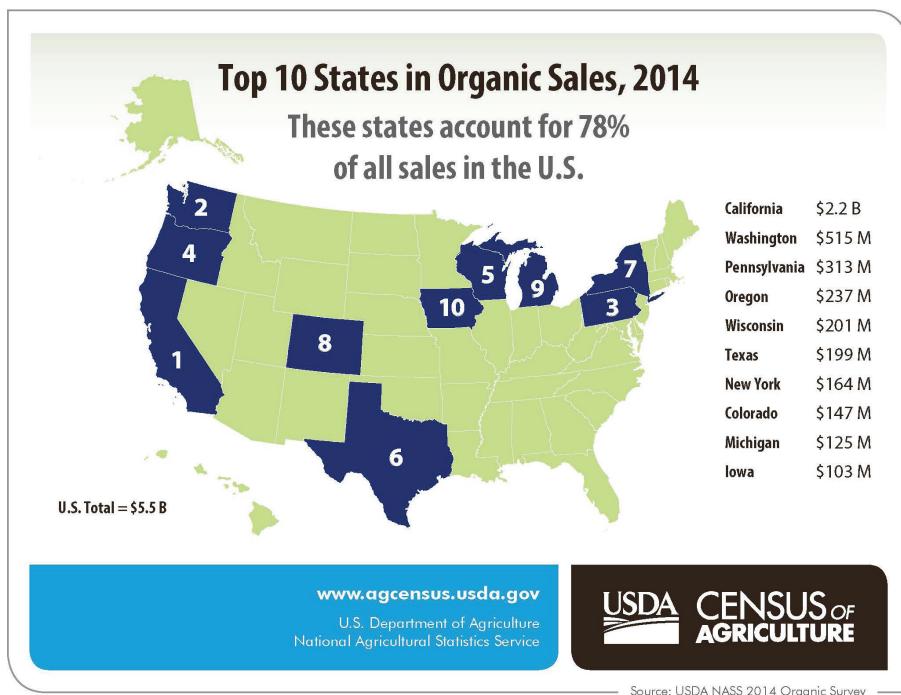


Organic products can be purchased at farmers markets, restaurants, food co-ops, and 75 percent of conventional grocery stores.⁴⁴ These products usually cost more than conventional products due to their higher cost of production. High consumer demand and willingness to pay the organic price premium has resulted in the expansion of certified organic acreage and livestock operations in the U.S. for many years.

California leads the nation in organic sales from farms, with \$2.2 billion in sales in 2014 (see Figure 38).⁴⁵

Figure 38: Top 10 States in Organic Sales (2014)

Source: USDA National Agricultural Statistics Service (NASS), 2014 Organic Survey



44 Ibid.

45 USDA National Agricultural Statistics Service. (2016). 2014 Organic Survey. Retrieved January 23, 2017, from https://www.agcensus.usda.gov/Publications/2012/Online_Resources/Organics/

Kern County Trends

The number of certified organic farms in Kern County increased from 23 farms in 2002 to 41 farms in 2012 (Figure 39a). Although this is a small number of farms relative to all the farms in Kern County (only 1–2 percent of all farms and 1–2 percent sales), Kern County farms led the state in organic sales in the early 2000s—in 2002, Kern County organic sales represented 17 percent of all California organic sales (Figure 39b). This dropped to 8 percent in 2007 and 3 percent in 2012, likely due both to decreased total sales in Kern County and to a significant increase in organic sales at the state level over the past decade.

Figure 39a: Total number of USDA certified organic farms, Kern County and California (2002–2012)

Source: USDA National Agricultural Statistics Service (NASS), Census of Agriculture (2002–2012)

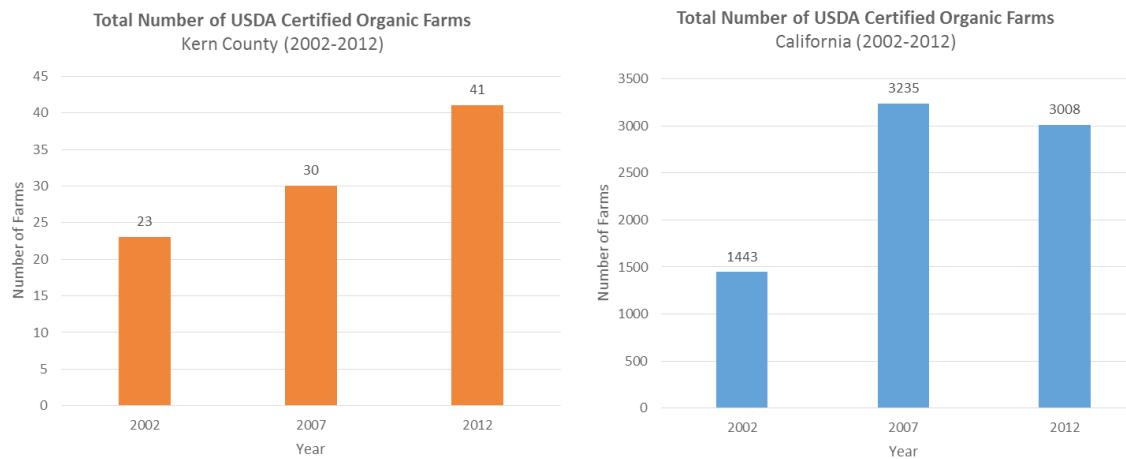
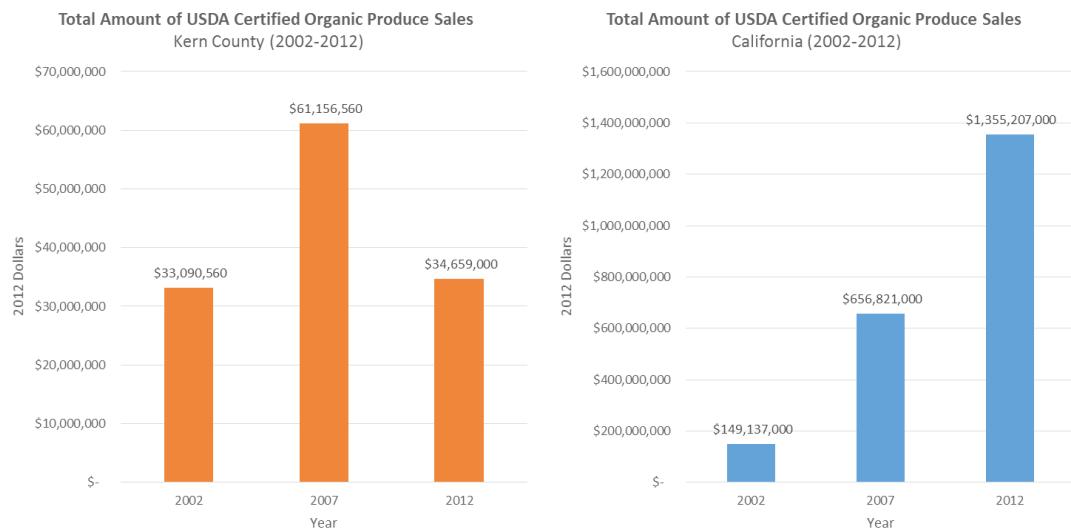


Figure 39b: Total amount of USDA certified organic sales, Kern County and California (2002–2012)

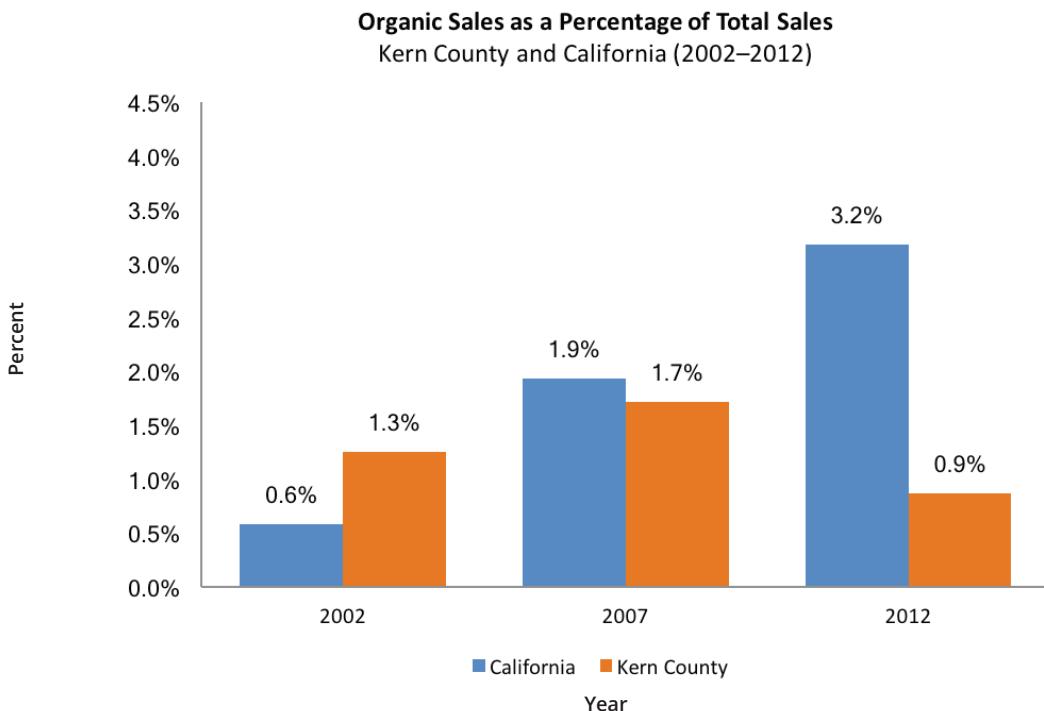
Source: USDA National Agricultural Statistics Service (NASS), Census of Agriculture (2002–2012)



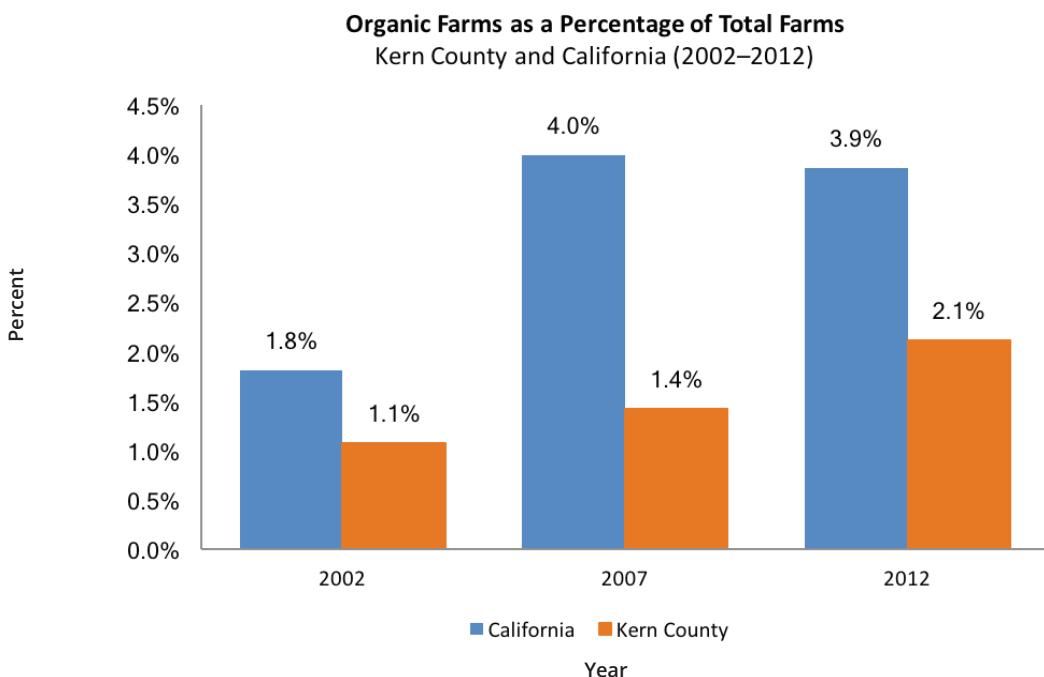
As a percentage of the overall agricultural sector in California, the organic sector in Kern County shows slower growth in both the sales (Figure 40a) and number of farms (Figure 40b) compared to the rest of the state. This is particularly true in terms of sales.

Figure 40a: Organic farms as a percentage of total farms in Kern County and California (2002–2012)

Source: USDA National Agricultural Statistics Service (NASS), Census of Agriculture (2002–2012)

**Figure 40b: Organic farms as a percentage of total farms in Kern County and California (2002–2012)**

Source: USDA National Agricultural Statistics Service (NASS), Census of Agriculture (2002–2012)



In 2002, the number of organic farms in California amounted to about 2 percent of all farms, increasing to 4 percent in 2007 and 2012. Organic sales grew from less than 1 percent of all farm sales in California in 2002 (\$149 million) to more than 3 percent (\$1.3 billion) in 2012. Approximately one quarter of U.S. organic farms are located in California,⁴⁶ and California organic sales represent a growing percentage of all U.S. organic farm sales—from 10 percent in 2002 to 18 percent in 2012.

Kern County has seen a slower rise in organic farms as a percentage of all farms over the past decade (from 1 percent in 2002 to 2 percent in 2012). Organic sales as a percentage of all agricultural sales in Kern County rose from 1.3 percent in 2002 to 1.7 percent in 2007, but then fell below 2002 levels to 0.9 percent in 2012.

GOAL 3.2: Kern County reduces risks associated with pesticide use

Background

Farmers use many different strategies and tools to manage the risks inherent in running a farm business. One risk that all farmers face is the risk of crop damage or loss due to pests.

Agricultural pests are organisms that damage or interfere with crops or that negatively impact human or animal health. Common agricultural pests include invertebrates (insects, snails), vertebrates (rodents, birds), weeds, nematodes, and pathogens (bacteria, viruses, fungi).

Farmers can manage the risk of pest damage in a variety of ways, including:

1. Biological control: Using a pest's natural enemies to control it—for example, through the introduction of a predator or parasite to that pest.
2. Cultural control: Using crop management practices that make the environment less friendly to pests—for example, by changing irrigation methods.
3. Mechanical and physical control: Physically damaging or blocking a pest's access to a crop—for example, pulling weeds, mulching, or using rodent traps.
4. Chemical control: Using pesticides that either kill pests or harm them in a way that reduces the damage they can do to a crop.⁴⁷

Both conventional and organic farmers may use all four approaches of pest control, though the pesticides allowed in organic agriculture are more limited than in conventional agriculture.

Indicator 3.2.1: Adoption of integrated pest management (IPM) practices

Background

Because most pesticides are designed to kill or harm living organisms, exposure to some pesticides at certain levels may also pose risks to humans, animals, or the environment.⁴⁸

Integrated pest management, commonly referred to as "IPM" is an ecosystem-based strategy of balancing and minimizing both types of risks—the risks associated with crop damage and the risks associated with environmental exposure to pesticides.⁴⁹ IPM focuses on long term prevention of pest damage by monitoring and managing the ecosystem in which crops grow. A variety of methods may be used together, including biological, cultural, mechanical, and chemical controls.

⁴⁶ USDA Economic Research Service. (2016). Organic Production. Retrieved January 23, 2017, from <https://www.ers.usda.gov/data-products/organic-production/organic-production/#State-Level Tables>

⁴⁷ Adapted from the University of California Statewide Integrated Pest Management Program's categorization of pest management approaches: <http://www2.ipm.ucanr.edu/WhatIsIPM/>

⁴⁸ U.S. Environmental Protection Agency. (n.d.). Pesticides and Public Health. Retrieved March 20, 2017, from <https://www.epa.gov/pesticides/pesticides-and-public-health>

⁴⁹ University of California Statewide Integrated Pest Management Program. (n.d.). What is IPM? Retrieved March 20, 2017, from <http://www2.ipm.ucanr.edu/WhatIsIPM/>

PHOTO CREDIT: SUSAN REEP



Honey bee hives, Kern County.

IPM practices may reduce the use of higher risk pesticides by replacing or supplementing them with lower risk alternatives, including chemical, biological, cultural, and/or mechanical methods of pest control. When practicing IPM, those pesticides that are used should be the safest and most selective pesticides available, applied in a way that minimizes potential harm to people and the environment.⁵⁰

In this section we focus on the use of several different types of pest control associated with IPM—the use of microbial pesticides, the use of pheromone-based pest control products, and the use of lower-risk chemical controls.

MEASURE 1: Use of microbial pesticides

Background

Biopesticides are pesticides that derived from natural materials. These pesticides are usually less toxic than conventional pesticides and may help reduce the use of more toxic pesticides while still keeping crops safe.⁵¹

Microbial pesticides are one type of biopesticide. This type of pesticide uses a microorganism as the active ingredient, such as a bacterium, fungus, virus or protozoan. The most commonly used microbial pesticides are subspecies and strains of *Bacillus thuringiensis*, commonly called Bt. Bt is a type of bacterium that produces proteins that kill insect larvae. Different strains are specific to different pests.

The number of acres treated with microbial pesticides has remained relatively steady over the past 25 years in California, though the crops they are applied to have changed over time. The most common crops currently treated with microbial pesticides are table grapes and strawberries. The use of microbial pesticides has increased over time in lettuce and almonds and has decreased in wine grapes.⁵²

Kern County Trends

Figure 41a shows that farmers in Kern County have used microbial pest control products like Bt for many years, with particularly high numbers of acres treated in the late 1990s and the early 2010s. The number of acres treated with these products has been increasing steadily over the past decade from a low in 2002, and was at its highest recorded level in 2014. In California, the use of microbial pesticides has been increasing since 2009 (see Figure 41b).

The crops with the largest number of acres treated with microbial products in Kern County are table grapes, pistachios, carrots, and almonds, with a particularly sharp increase since 2011 in pistachios

⁵⁰ Ibid

⁵¹ U.S. Environmental Protection Agency. (n.d.). What are biopesticides? Retrieved March 20, 2017, from <https://www.epa.gov/ingredients-used-pesticide-products/what-are-biopesticides>

⁵² California Department of Pesticide Regulation. (1990-2014). Pesticide Use Reports. Retrieved using PUR Web GIS: <http://ziram.lawr.ucdavis.edu/PURwebGIS.html>

and carrots. The use of microbial products in wine grapes and almonds has decreased in Kern County from a peak in the 1990s and early 2000s.⁵³

Figure 41a: Total acres treated with microbial pesticides in Kern County (1990–2014)

Source: California Department of Pesticide Regulation, Pesticide Use Reports 1990–2014⁵⁴

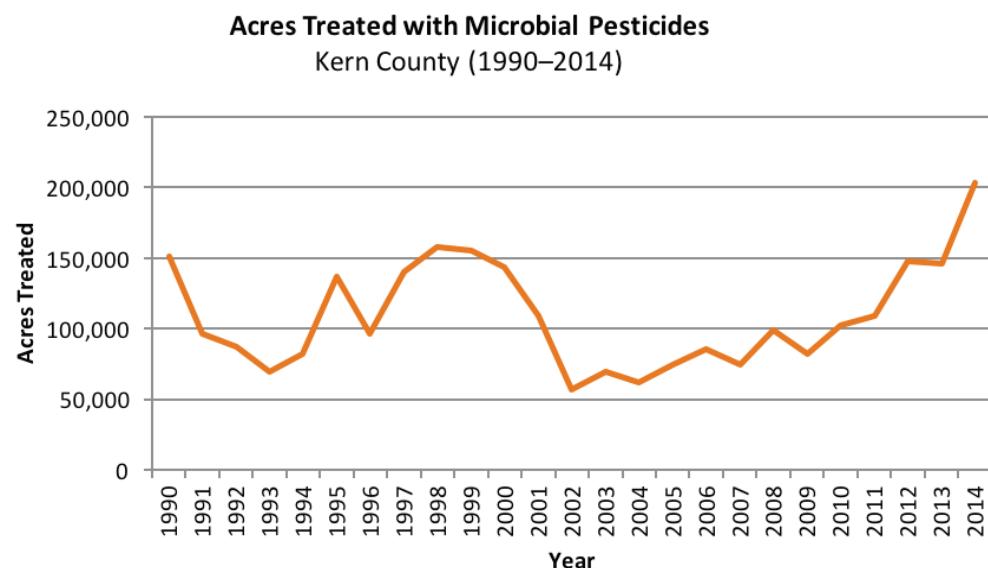
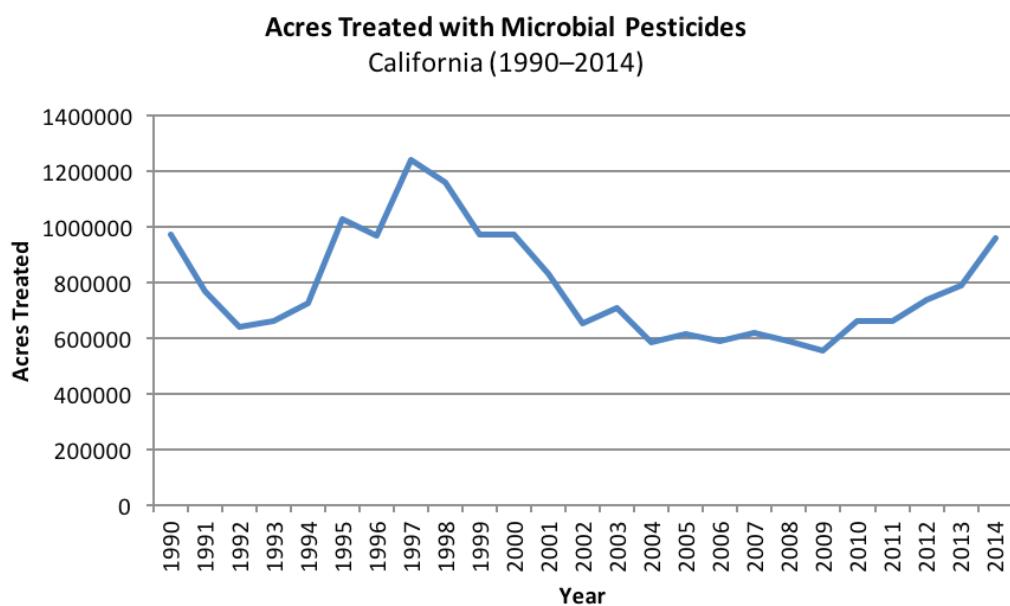


Figure 41b: Total acres treated with microbial pesticides in California (1990–2014)

Source: California Department of Pesticide Regulation, Pesticide Use Reports 1990–2014



⁵³ Ibid

⁵⁴ See Appendix C for full list of included microbial products

MEASURE 2: Use of pheromone pest control products

Background

Biochemical pesticides are another type of biopesticide. These pesticides control pests by non-toxic mechanisms. One example is the use of pheromone-based products. Pheromones can be used to interfere with insect mating and reproduction, or as bait in traps to help farmers monitor pest populations and decide when control is needed. In both cases, the use of pheromones may reduce the use of higher risk pest control methods.

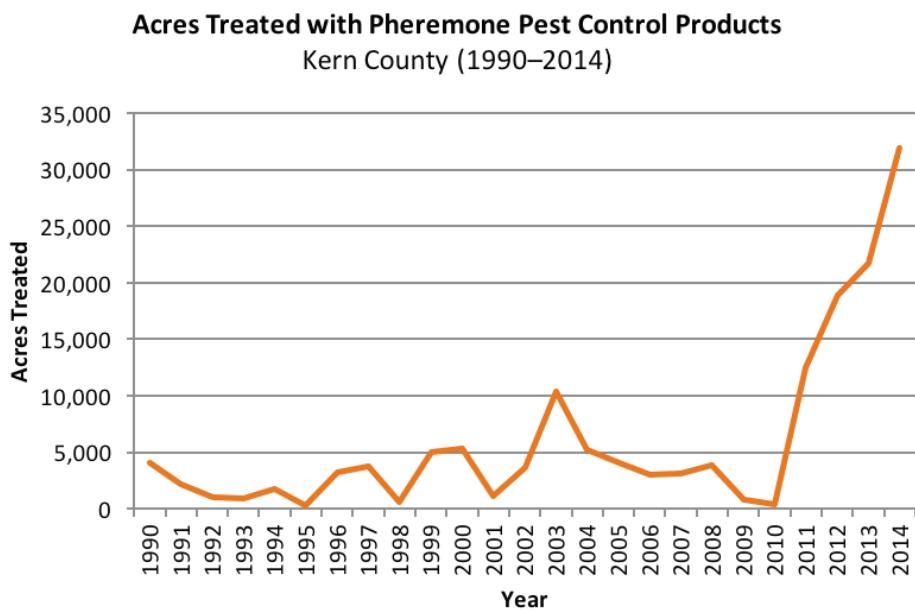
In California, pheromones are most commonly used in orchard crops like nuts (almonds, pistachios) and stone fruit (peaches, nectarines, plums). They are also used in pears and grapes.⁵⁵

Kern County Trends

In Kern County, pheromones are primarily used in almonds and pistachios for mating disruption of Navel Orange Worm. The use of pheromones as bait in traps is also common in many crops in Kern County. However, when used in this way pheromones are not considered pesticides and are not included in pesticide use data.⁵⁶

Figures 42a and 42b show trends in the use of pheromone pest control products in Kern County and California over the last 25 years.

Figure 42a: Total acres treated with pheromone pest control products in Kern County (1990–2014)
Source: California Department of Pesticide Regulation, Pesticide Use Reports 1990–2014⁵⁷



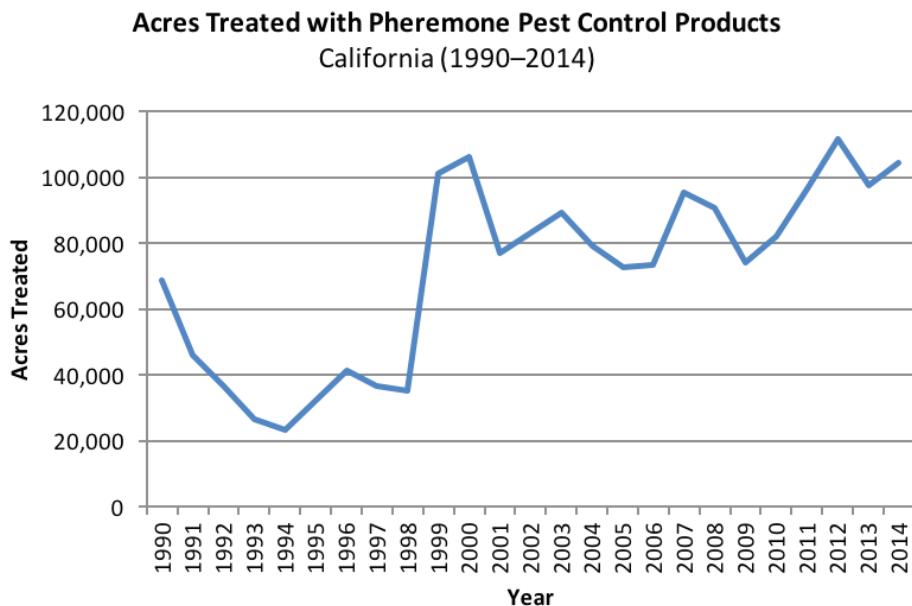
⁵⁵ CDPR Pesticide Use Report (queried by acres treated and crop from 2010–2014)

⁵⁶ Personal communication with David Haviland, UCCE Kern County

⁵⁷ See Appendix D for full list of included pheromone products

Figure 42b: Total acres treated with pheromone pest control products in California (1990–2014)

Source: California Department of Pesticide Regulation, Pesticide Use Reports 1990–2014



The use of pheromone pest control products has increased in both California and Kern County. There has been a particularly large increase in Kern County over the last 5 years.

Biocontrol of aflatoxins in pistachio and almond crops

Aflatoxins are carcinogenic mycotoxins produced by two closely related fungi, *Aspergillus flavus* and *Aspergillus parasiticus*. These fungi may grow naturally in many crops, including corn, peanuts, wheat, cottonseed, pistachios, and almonds. Aflatoxin contamination of crops is a food safety concern worldwide.

Among various strategies to control aflatoxins, biological control is currently the most promising.¹ A naturally occurring strain of *Aspergillus flavus*, known as AF36, does not produce aflatoxins and can be introduced to fields to compete with toxin-producing strains.

In Kern County, AF36 is introduced to pistachio and almond fields in late spring or early summer and then activated by irrigation. Because it gets a head start on other *Aspergillus* strains, it is able to displace them by as much as 95 percent within three years.²

Controlling Navel Orange Worm through the use of pheromones can also help prevent aflatoxins from impacting crops, as 90 percent of aflatoxins are found in nuts that were previously damaged by Navel Orange Worm.³

In this case, a coordinated effort involving the California pistachio industry, UC Cooperative Extension, and two biological control agents are helping keep California's nut growers and consumers safe.

1 Yin, Y., Yan, L., Jiang, J., & Ma, Z. (2008). Biological control of aflatoxin contamination of crops. *Journal of Zhejiang University. Science B*, 9(10), 787–792. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2565741/>

2 Beede, B., & Klein, B. (2013). AF36 How it Works. Retrieved March 20, 2017, from <https://www.youtube.com/watch?v=YNUuUDgHMd0>

3 Beede, B., & Klein, B. (2013). AF36 How it Works. Retrieved March 20, 2017, from <https://www.youtube.com/watch?v=YNUuUDgHMd0>

MEASURE 3: Use of pesticides by estimated risk level

Background

The primary role of chemical control (pesticides) in agriculture is to protect the quality of the food supply and the livelihood of farmers. Pesticides reduce a range of risks associated with food production, including crop damage or loss from pests, disease, or contamination. Some of the products used to manage these risks, however, come with risks of their own, including potential harm to human, animal, or environmental health.

California has the most advanced system in the world for tracking how, when, and where pesticides are applied. Though use reporting on some level has been required since the 1950s, today's comprehensive use reporting system was established in 1990 in response to public concerns about the potential risks of pesticide exposure, particularly to agricultural workers.⁵⁸

In this section, we will look at the use of higher and lower risk pesticides over time as an additional indicator of the possible impact of IPM practices in Kern County. Risk level is estimated based on inclusion or exclusion in CalEnviroScreen 2.0's List of Hazardous and Volatile Pesticides. Higher risk pesticides have been further categorized as "fumigants" and "non-fumigants" due to the very different average application rates (pounds per acre) for each type of pesticide. For a full list of pesticides and their risk level designation, see Appendix E.

Kern County Trends

Total pounds of active ingredient applied

One way to measure the use of pesticides is by tracking the total pounds of that pesticide's active ingredient that have been applied.⁵⁹ Figures 43a and 43b show trends in pesticide use in Kern County and California by estimated risk level (lower risk, higher risk non-fumigants, higher risk fumigants).



Aerial application of pesticide, Kern County.

The total pounds of higher risk non-fumigant pesticides applied in Kern County has decreased over the past two decades, mirroring a similar trend in California.⁶⁰ Out of the 69 higher risk pesticides included here, 59 are non-fumigants, so this represents a decline in use of the majority of the higher risk pesticides currently registered in California. There has been a corresponding increase in the use of lower risk pesticides in Kern County, though we found the opposite trend statewide, where the use of lower risk pesticides has decreased. The use of higher risk fumigants has increased in both Kern County and California.

58 California Department of Pesticide Regulation. (2000). Overview of Pesticide Use Reporting. Retrieved March 21, 2017, from <http://www.cdpr.ca.gov/docs/pur/purorvw/tabofcon.htm>

59 Pesticide formulations often include both active ingredients (the chemicals that do the pest control work) and inert ingredients (for example, oils or liquids to carry the chemical or help it spread appropriately). There may be many different pesticide formulations in use with a given active ingredient, produced for different uses or by different manufacturers. For the purpose of this assessment, we looked at total pounds of active ingredient applied only, rather than tracking the use of entire product formulations.

60 All pesticide use trends statistically significant at 95% confidence level from 1990–2014 unless otherwise noted.

Assessing IPM, not pesticide risk

The purpose of this section is NOT to assess the risks of pesticide use to the people or environment of Kern County.

Each pesticide used in California has a unique profile in regards to its toxicity, how it moves and is dispersed through different mediums (water, air, soil), and the length of time it stays active in the environment. Assessing pesticide risk is a complex process that involves many factors in addition to levels of use—this includes but is not limited to how and where the pesticide is applied, current weather conditions, and the proximity and vulnerability of humans or other living organisms.

Instead, this section looks at how integrated pest management (IPM) practices may be reducing the use of the highest risk pesticides in Kern County.

We determined the risk category for each pesticide using CalEnviroScreen 2.0's list of hazardous and volatile pesticides.¹ All pesticides included on the CalEnviroScreen list were categorized as "higher risk." Pesticides not on the list were categorized as "lower risk." These are broad and relative designations. Lower risk does not mean low risk or no risk, and higher risk does not mean that the pesticide has actually caused harm. California has a complex system of regulations and monitoring systems to help minimize risks associated with pesticide use. In general, pesticides that are known to be highly toxic and/or volatile will be more highly regulated than lower risk pesticides, reducing their inherent risk through more careful use.

Although it is not the only factor and cannot be used to determine risk in isolation, studies have shown correlation between high levels of pesticide use and both pesticide exposure and pesticide-related acute and chronic illness.²³⁴⁵⁶⁷ Farmworkers and children may be most at risk.⁸ For this reason, practicing IPM may improve public and environmental health outcomes by encouraging the use of lower risk pesticides and non-chemical methods of pest control when possible.

-
- 1 CalEnviroScreen is an environmental health screening tool developed by the Office of Environmental Health Hazard Assessment (OEHHA) at the request of the California Environmental Protection Agency (CalEPA). This tool identifies communities that face multiple pollution burdens and other vulnerabilities in order to prioritize state assistance. One indicator included in the tool is pesticide use.
 - 2 Bradman A, Eskenazi B, Barr DB, Bravo R, Castorina R, Chevrier J, et al. (2005). Organophosphate urinary metabolite levels during pregnancy and after delivery in women living in an agricultural community. *Environ Health Perspect* 113(12):1802-7.
 - 3 Bradman, A., Whitaker, D., Quirós, L., Castorina, R., Henn, B. C., Nishioka, M., ... & Sheldon, L. S. (2007). Pesticides and their metabolites in the homes and urine of farmworker children living in the Salinas Valley, CA. *Journal of Exposure Science and Environmental Epidemiology*, 17(4), 331-349.
 - 4 Harnly ME, Bradman A, Nishioka M, McKone TE, Smith D, McLaughlin R, et al. (2009). Pesticides in dust from homes in an agricultural area. *Environ Sci Technol* 43(23):8767-74.
 - 5 Quiros-Alcalá L, Bradman A, Nishioka M, Harnly ME, Hubbard A, McKone TE, et al. (2011). Pesticides in house dust from urban and farmworker households in California: an observational measurement study. *Environ Health* 10:19.
 - 6 Koutros S, Beane Freeman LE, Lubin JH, Heitshe SL, Andreotti G, Barry KH, et al. (2013). Risk of total and aggressive prostate cancer and pesticide use in the Agricultural Health Study. *Am J Epidemiol* 177 (1):59-74
 - 7 Lee SJ, Mehler L, Beckman J, Diebolt-Brown B, Prado J, Lackovic M, et al.(2011). Acute Pesticide Illnesses Associated with Off-Target Pesticide Drift from Agricultural Applications: 11 States, 1998–2006. *Environmental health perspectives* 119(8):1162.
 - 8 California Department of Public Health. (2014). Agricultural pesticide use near public schools in California. CDPH Environmental Health Tracking Program.

Figure 43a: Pesticide use in Kern County by estimated risk level (total pounds of active ingredient applied)

Sources: California Department of Pesticide Regulation—Pesticide Use Reports (1990–2014); California Environmental Protection Agency (CalEPA) and Office of Environmental Health Hazard Assessment (OEHHA)—California Communities Environmental Health Screening Tool Report (CalEnviroScreen 2.0, updated October 2014)

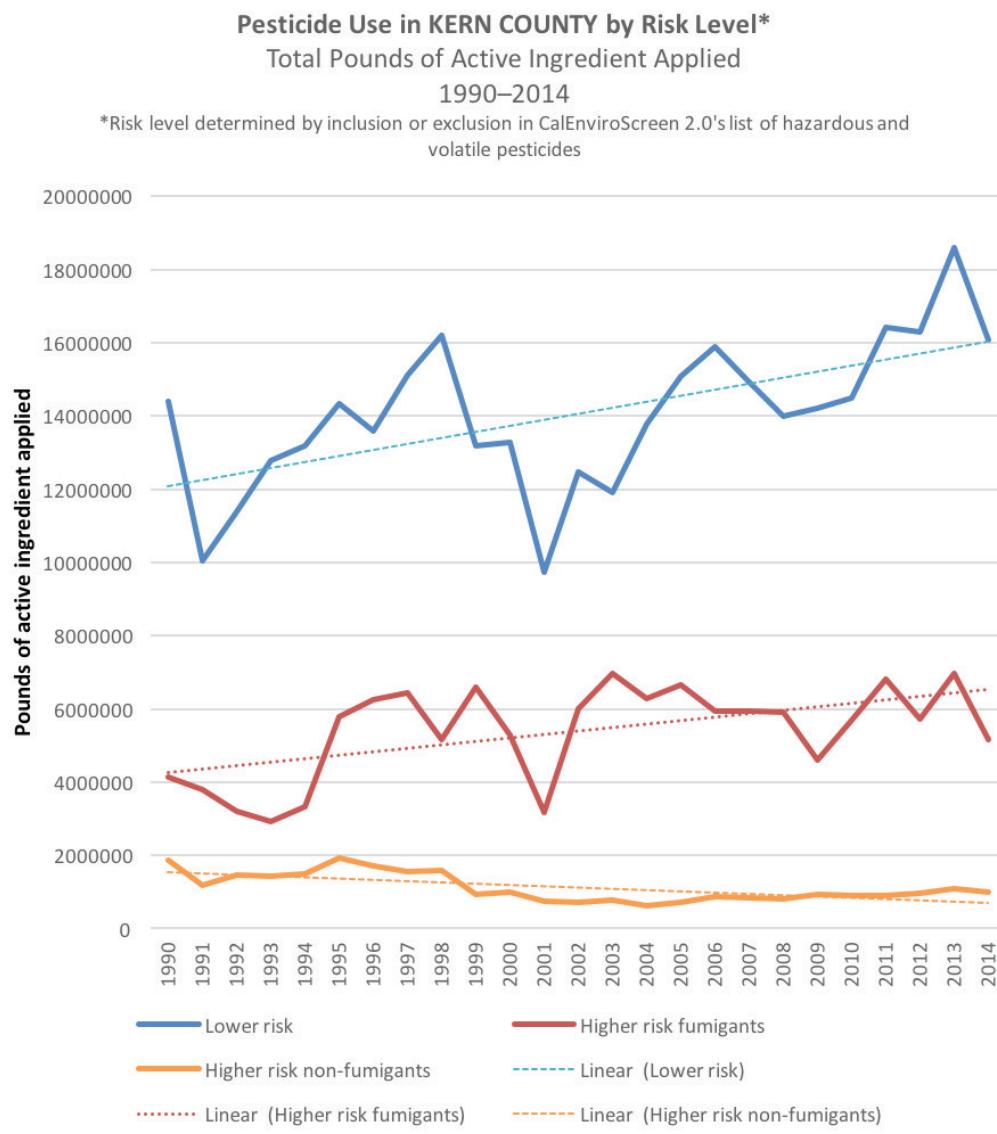
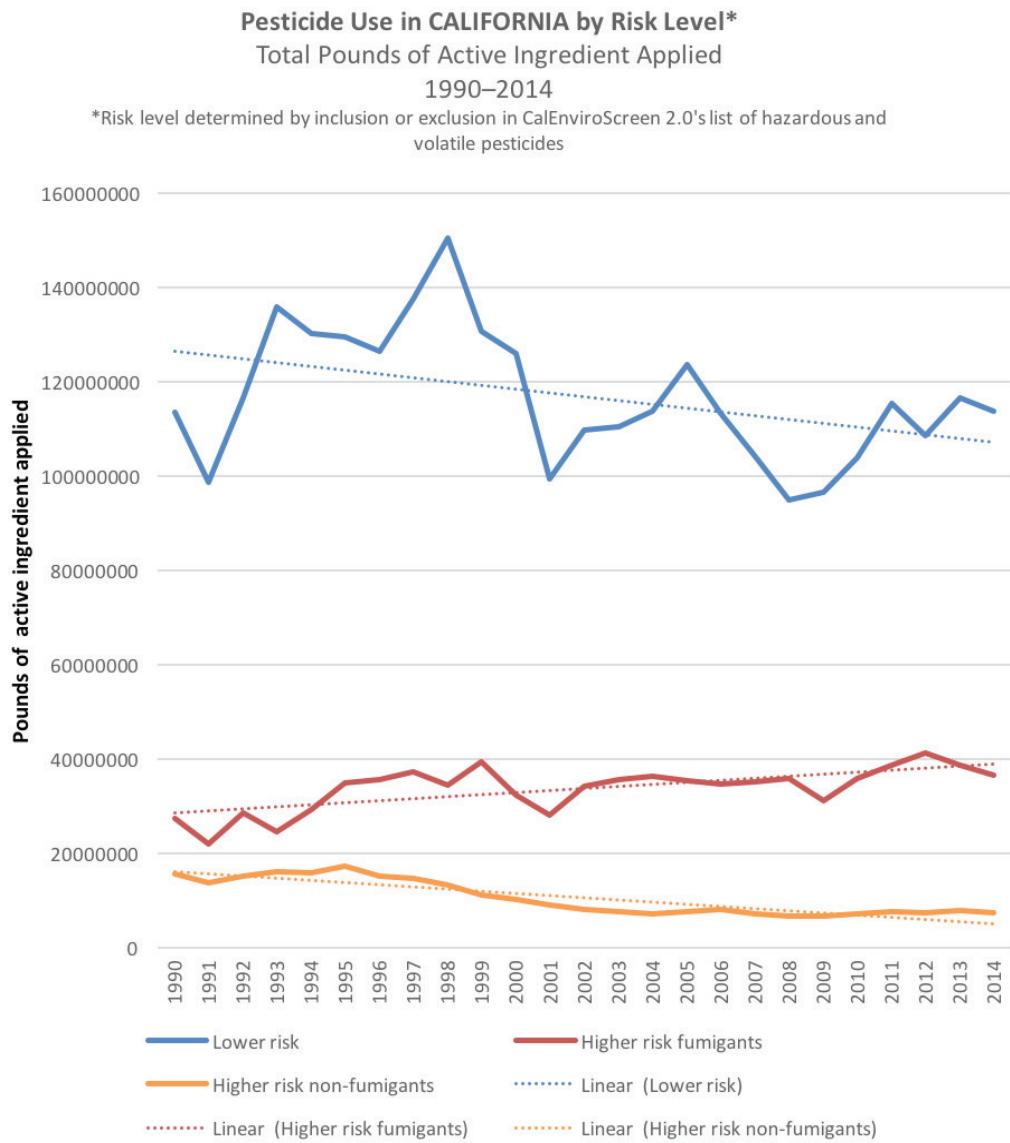


Figure 43b: Pesticide use in California by estimated risk level (total pounds of active ingredient applied)

Sources: California Department of Pesticide Regulation—Pesticide Use Reports (1990–2014); California Environmental Protection Agency (CalEPA) and Office of Environmental Health Hazard Assessment (OEHHA—California Communities Environmental Health Screening Tool Report (CalEnviroScreen 2.0, updated October 2014)



Total acres treated

In addition to pounds of active ingredient applied, pesticide use can also be measured in terms of the number of acres treated. Trends in total acres treated in Kern County mirror trends in pounds applied—the use of lower risk pesticides is increasing while the use of higher risk non-fumigants is decreasing (see Figure 44a).

In California, use of lower risk pesticides has decreased in terms of pounds of active ingredient applied but increased in terms of acres treated, suggesting that at least some of these pesticides are being applied at lower rates (Figure 44b). This could be due to different application methods, formulations, active ingredients, or crops grown.

Figure 44a: Pesticide use in Kern County by risk level (acres treated, 1990–2014)

Sources: California Department of Pesticide Regulation—Pesticide Use Reports (1990–2014); California Environmental Protection Agency (CalEPA) and Office of Environmental Health Hazard Assessment (OEHHA)—California Communities Environmental Health Screening Tool Report (CalEnviroScreen 2.0, updated October 2014)

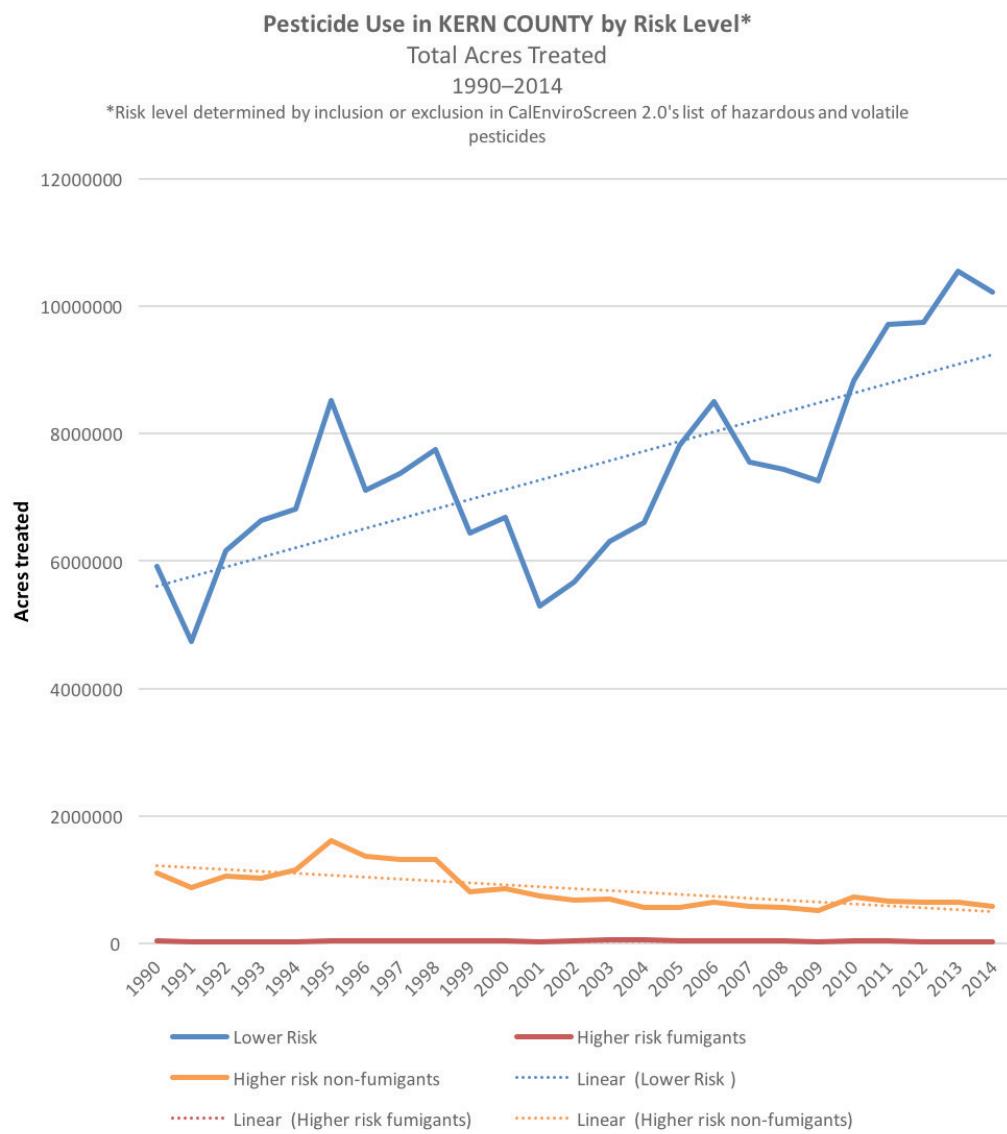
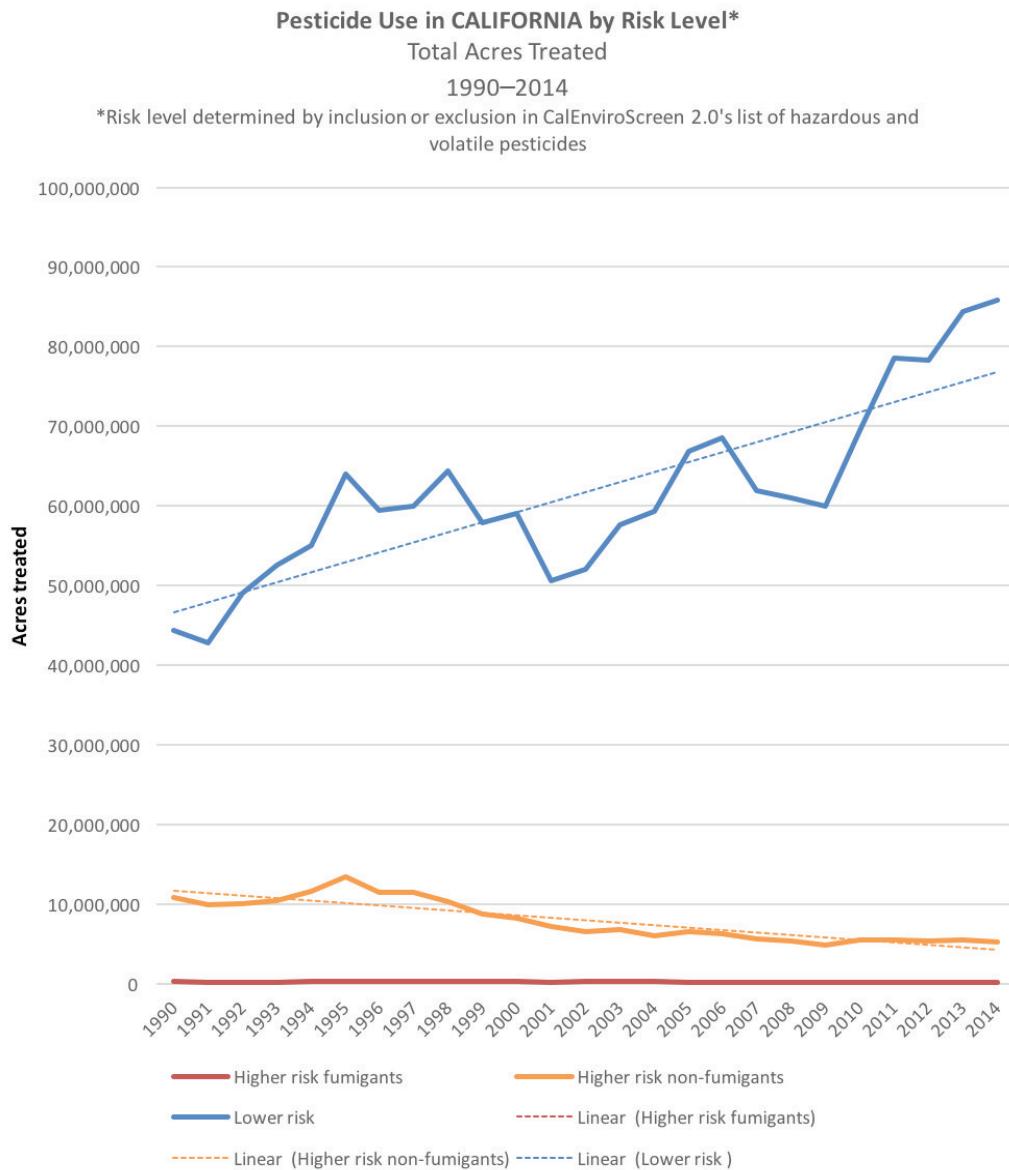


Figure 44b: Pesticide use in California by risk level (acres treated, 1990–2014)

Sources: California Department of Pesticide Regulation—Pesticide Use Reports (1990–2014); California Environmental Protection Agency (CalEPA) and Office of Environmental Health Hazard Assessment (OEHHA)—California Communities Environmental Health Screening Tool Report (CalEnviroScreen 2.0, updated October 2014)



Fumigants

Fumigants are used prior to planting to protect crops from soil borne pathogens like nematodes, bacteria, and fungi. These types of pesticides are generally both highly toxic and highly volatile, and can also be a source of volatile organic compounds (VOCs) and contribute to ozone depletion. The UC Statewide IPM program recommends using fumigants as a last resort when no other methods of control are effective or available.⁶¹

61 University of California Statewide Integrated Pest Management Program. (2009). Management of Soilborne Pathogens. Retrieved March 21, 2017, from <http://ipm.ucanr.edu/PMG/r280190211.html>

Fumigants are the only subgroup of higher risk pesticides whose use has increased over the last 25 years in terms of pounds of active ingredient applied. However, Figure 44a and 44b show that only a very small number (less than 0.5 percent) of the total acres treated with pesticides in California are treated with fumigants.

Because of the way CDPR collects and publishes use data, each “acre treated” is better understood as a single treatment of an acre with a given pesticide. This is why the total number of acres treated each year is higher than the total number of acres cropped each year. Each cropped acre may receive multiple pesticide treatments over the course of the year (depending on the crop, environmental conditions, etc.).

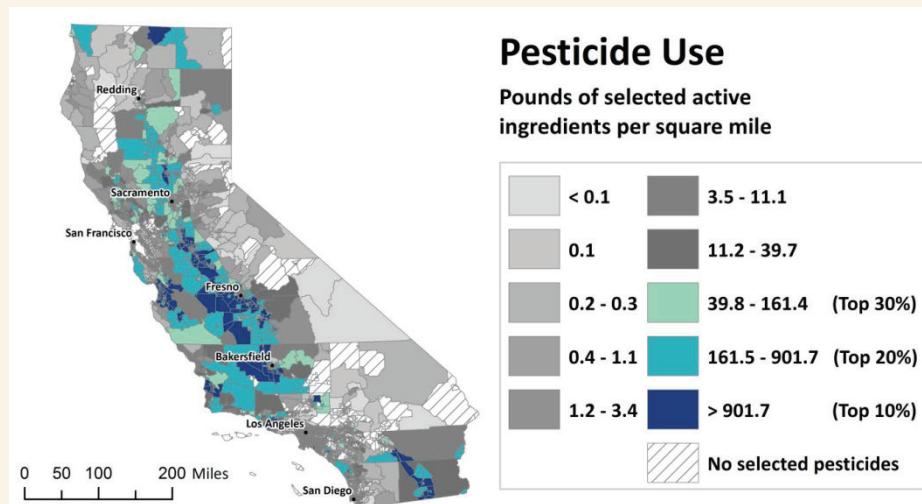
There was no statistically significant change in the number of acres treated with fumigants in Kern County between 1990 and 2014, and a very slight decrease over the same time period in California.

Mapping pesticide use

The risk designations in this assessment are based on CalEnviroScreen 2.0’s list of hazardous and volatile pesticides. CalEnviroScreen 2.0 includes a mapping tool where applications of this subgroup of higher risk pesticides can be viewed by census tract. This map may be viewed by visiting the CalEnviroScreen website and selecting the “pollution burden maps” for CalEnviroScreen 2.0. One of the 12 pollution burden indicators is the use of higher risk pesticides.

Figure: CalEnviroScreen 2.0 – Pesticide Indicator Maps

Source: California Communities Environmental Health Screen Tool, Version 2.0



CalEnviroScreen was updated on to version 3.0 on January 9, 2017. Version 3.0 includes one additional pesticide, ethylene glycol, which met CalEnviroScreen’s hazard and volatility criteria. Due to the timing of its addition, ethylene glycol is not included in this assessment.

CalEnviroScreen 3.0 indicator mapping tools are available at: <https://oehha.maps.arcgis.com/apps/MapSeries/index.html?appid=8dad35dcd2274285874e60871c404edc>

This, combined with increases in the total pounds of fumigant active ingredient applied, suggests an increase in the rate (pounds per acre treated) of higher risk fumigants used in both Kern County and in California.

INDICATOR 3.2.2: Adherence to pesticide use regulations

Background

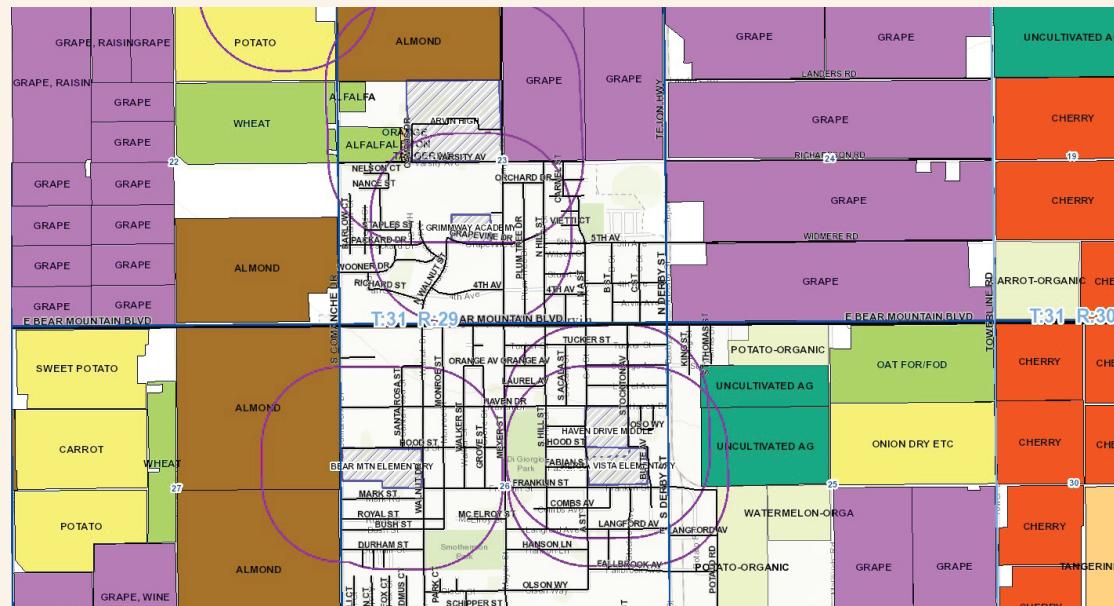
Pesticides are regulated to protect the environment and public health both at the federal and state level. In California, pesticide regulation is the joint responsibility of the California Department of Pesticide Regulation and the County Agricultural Commissioners. County agricultural commissioners collect pesticide use data and enforce pesticide regulations at the county level.

The GIS team at the Kern County Agricultural Commissioner's Office also uses CDPR pesticide use data to create maps and assess the use of higher risk pesticides near more vulnerable populations, like schools. A 2013 report by the Kern County Agricultural Commissioner's Office showed that the use of restricted materials (another subset of higher risk pesticides) near schools in Kern County to be decreasing.

The relationship of schools to agricultural fields can be viewed on the crop map of Kern County that is updated daily by the Agricultural Commissioner's office: <http://www.kernag.com/cropmap/>

Figure: Kern County Crop Map, zoomed in to several Kern County schools (Arvin High School, Grimmway Academy, Bear Mountain Elementary, Haven Drive Middle School, Sierra Vista Elementary)

Source: Kern County Agricultural Commissioner's Office, Kern County Crop Map

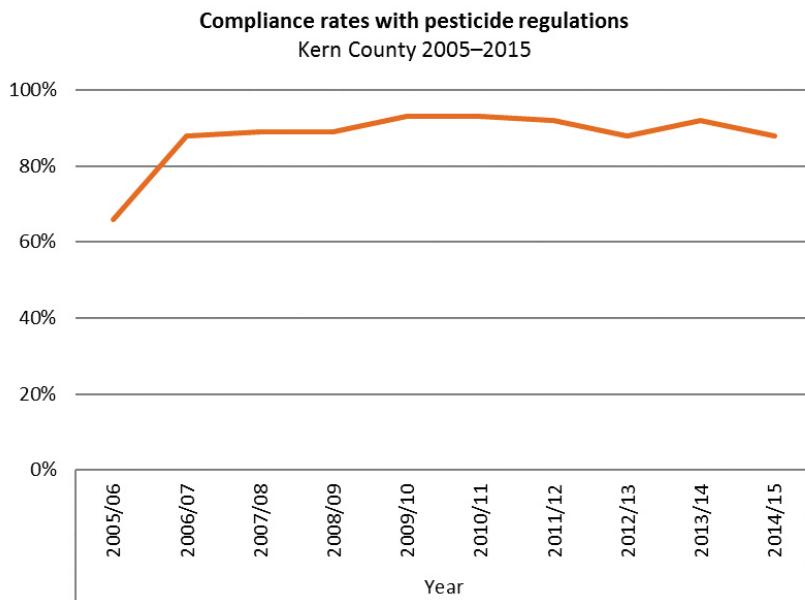


MEASURE 1: Pesticide regulation compliance rates

County agricultural commissioners conduct regular inspections to ensure that pesticides are applied in compliance with existing pesticide law. Each inspection covers multiple regulations, and any areas where an operation is out of compliance are noted and may be subject to a warning or fine.

Figure 45: Compliance rates⁶² with pesticide regulations in Kern County (2005–2015)

Source: Kern County Agricultural Commissioner's Office⁶³



In 2005/2006, the compliance rate in Kern County was only 66 percent (Figure 45). At that time, the Kern County Agricultural Commissioner's Office, Kern County UC Cooperative Extension, and Kern County Farm Bureau all stepped up their efforts to help increase compliance through enforcement, education, and farmer organizing.⁶⁴ Since then, compliance rates have risen and remained steady at between 88 and 93 percent.

MEASURE 2: Reported pesticide drift incidents

Background

Some pesticides can move through the air. The distance they are able to move may depend on the type of pesticide (fumigants are particularly prone to drift),⁶⁵ how the pesticide was applied, and what wind or other weather conditions were like during or after the application. When pesticides move off the site they were originally applied to, this is referred to as drift. Drift incidents can cause human illness and property damage, including to nearby crops. Not all drift is illegal, however. Pesticide law focuses on drift that causes harm or has the potential to do so.⁶⁶

⁶² The compliance rate is the inverse of the number of non-compliances found over the total number of inspections conducted. For example, if 100 inspections were conducted and two farms were out of compliance with 5 violations each, the compliance rate would be 90 percent. If two farms were out of compliance with only 1 violation each, the compliance rate would be 98 percent.

⁶³ This data was provided in summary form by the Kern Co Ag Commissioner's office. It is available in more detail through the Pesticide Regulatory Activities Monthly Report (PRAMR) available at: <http://www.cdpr.ca.gov/docs/enforce/report5.htm>

⁶⁴ Personal communication with staff at Farm Bureau, Kern County Cooperative Extension, and the Kern County Agricultural Commissioner's Office.

⁶⁵ California Department of Pesticide Regulation. (2013). Pesticide Drift Pocket Guide. Retrieved March 21, 2017, from http://www.cdpr.ca.gov/docs/enforce/cmplast/pesticide_drift.pdf

⁶⁶ California Department of Pesticide Regulation. (2013). Pesticide Drift Pocket Guide. Retrieved March 21, 2017, from http://www.cdpr.ca.gov/docs/enforce/cmplast/pesticide_drift.pdf

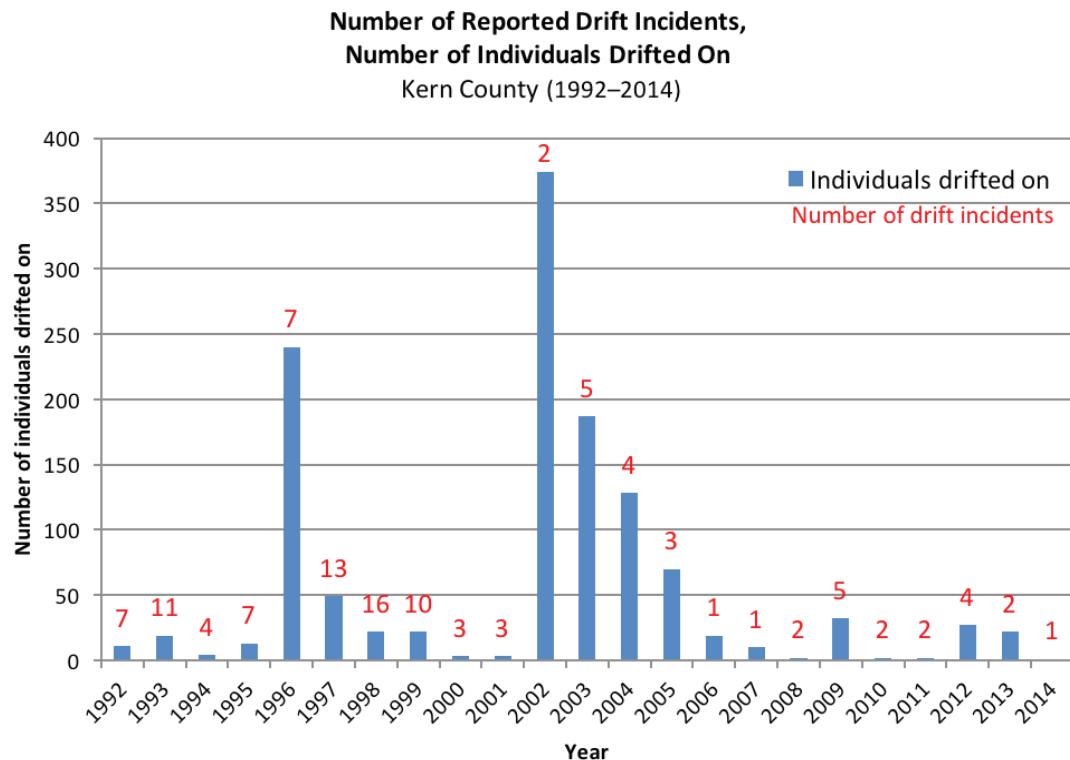
Those applying pesticides have the primary responsibility for preventing drift. The California Department of Pesticide Regulation and county agricultural commissioners are responsible for making sure that pesticide levels in the air do not pose risks to humans or other living organisms by enforcing standards on how, when, and where pesticides can be applied.⁶⁷ CDPR also has an Air Quality Initiative, which is a comprehensive effort to improve air quality statewide. This initiative focuses on reducing emissions from fumigants, reformulating pesticide products to reduce emissions, promoting new environmentally friendly technologies, and developing strategic pest management partnerships with industry.⁶⁸

Kern County Trends

Figure 46 shows the total number of reported drift incidents in Kern County from 1992 to 2014 (red numbers), as well as the number of individuals drifted on each year (blue bars). The number of individuals reporting drift incidents annually in Kern County has decreased over the last decade.

Figure 46: Number of reported drift incidents and number of individuals drifted on in Kern County (1992–2014)

Source: California Pesticide Illness Query (CalPIQ)



67 California Department of Pesticide Regulation. (n.d.). Drift. Retrieved March 21, 2017, from <http://www.cdpr.ca.gov/docs/enforce/drftinit/drftmenu.htm>

68 California Department of Pesticide Regulation. (n.d.). Air Quality Initiative. Retrieved March 21, 2017, from <http://www.cdpr.ca.gov/docs/emon/airinit/airinit.htm>

MEASURE 3: CDPR enforcement actions related to worker safety

Background

When an incident occurs in which a pesticide law or regulation is violated, county agricultural commissioners (CACs) are responsible for determining an appropriate response. CACs may issue “compliance actions,” which document violations and sometimes include public protection actions, but do not impose fines (for example, a warning letter). They may also issue “enforcement actions,” which impose a civil penalty (fine) or the loss of a right or privilege.

Enforcement actions are initiated by a Notice of Proposed Action (NOPA), after which defendants have a right to a hearing to contest allegations of violations. The fine level assessed is related both to the seriousness of the violation and any previous history of violations.

A subset of these violations are designated by the California Department of Pesticide Regulation (CDPR) as “citations for worker safety.” Most commonly, these involve failure to comply with preventative measures designed to protect workers from pesticide exposure. Most citations for worker safety are classified as Class B or Moderate Violations, with fine levels ranging from \$250–\$1000.⁶⁹

In some counties, violations may result in compliance actions (warning letters) only. This was identified as a statewide challenge to achieving pesticide regulation compliance in a 2002 report⁷⁰ that showed 85 percent of violations in California in fiscal year 2000/2001 resulted in warning letters only.

It is beyond the scope of this assessment to analyze changes in the ratio of compliance to enforcement actions in Kern or other California countries since this 2002 report. However, it is the current policy of the Kern County Agricultural Commissioner that all violations (100 percent) are subject to enforcement actions (fines) rather than compliance actions (warning letters).⁷¹

Kern County Trends

Figures 47a and 47b show that worker safety violations make up a much larger portion of all fines (enforcement actions) in Kern County than in California as a whole.

Based on previous statewide analysis⁷² and the policy of the Kern County Agricultural Commissioner to take enforcement action against all violations, we believe these data suggest that Kern County takes worker safety violations seriously, rather than suggesting there are more worker safety violations in Kern County than in other counties.



Workers harvesting peppers in Kern County.

PHOTO CREDIT: GREG ISOR

⁶⁹ For a more detailed account of types of actions, violation classes, and fine levels, see Appendix F, California Code of Regulations Title 3, Division 6, Chapter 1, Subchapter 3, Article 1

⁷⁰ Reeves, M., Katten, A., & Guzmán, M. (2002). Fields of poison 2002: California farmworkers and pesticides. Californians for Pesticide Reform.

⁷¹ Personal communication with Kern County Agricultural Commissioner Ruben Arroyo, October 2016

⁷² Reeves, Katten and Guzman 2000

Figure 47a: CDPR Enforcement Actions related to worker safety in Kern County (2000–2014)

Source: California County Agricultural Commissioner Administrative Civil Penalties Report, accessed through public records request to CDPR, fulfilled by Roy Hirose.

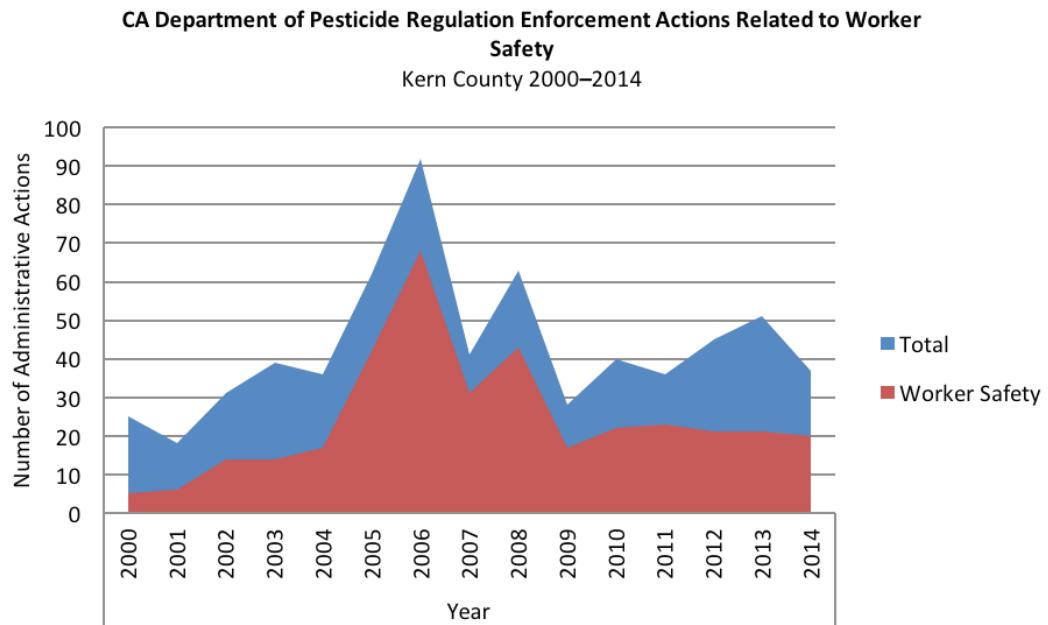
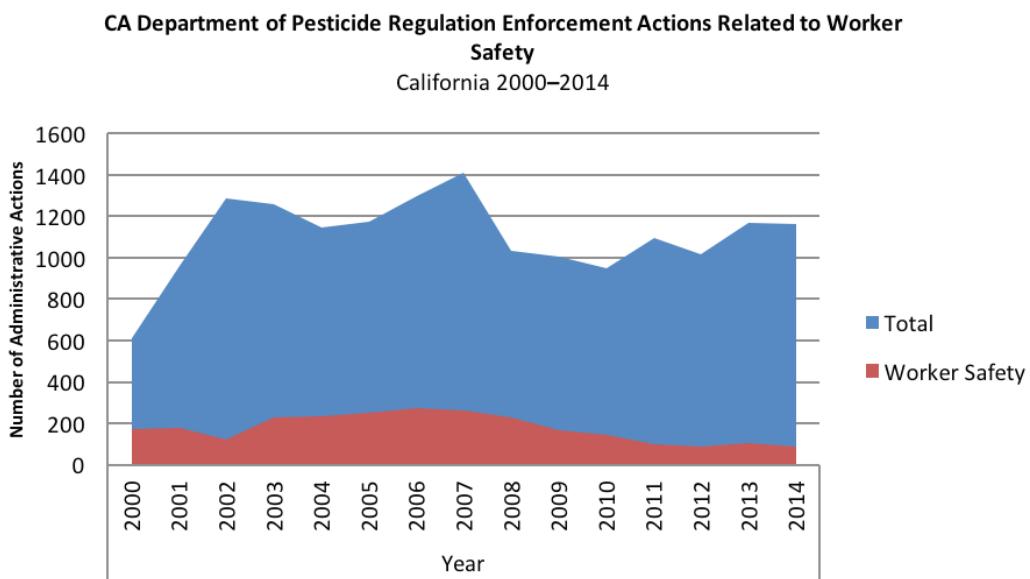


Figure 47b: CDPR Enforcement Actions related to worker safety in Kern County (2000–2014)

Source: California County Agricultural Commissioner Administrative Civil Penalties Report, accessed through public records request to CDPR, fulfilled by Roy Hirose.



Spray Safe – Kern County Farm Bureau

Spray Safe is a program of the Kern County Farm Bureau that encourages the safe application of agricultural chemicals through education and farmer to farmer communication and cooperation.

Pesticide spray drift is a concern because it affects human and animal health, can contaminate drinking water and natural habitats, and can damage crops and soils. Spray Safe was put into place more than a decade ago when current Spray Safe Committee co-chair, Jeff Rasmussen, observed that pesticide spray drift and overspray incidents could be avoided through education. He and others from the Farm Bureau, the Agricultural Commissioner's Office, and UC Cooperative Extension designed Spray Safe to educate farmers, applicators, workers and others in the agricultural industry about the safest practices in pesticide application.

In Kern County, pesticide accidents have decreased since Spray Safe's first conference in 2006. The program offers education in both English and Spanish to reach more farm labor workers.

GOAL 3.3: Kern County's water resources are conserved and support ecosystem health

Background

Water Sources and Historical Use

The Tulare Lake Basin is located in the San Joaquin Valley, and is the southernmost water basin in California's Central Valley (See Figure X). Kern County and parts of Tulare, Kings, and Fresno Counties fall within the Tulare Lake Basin.

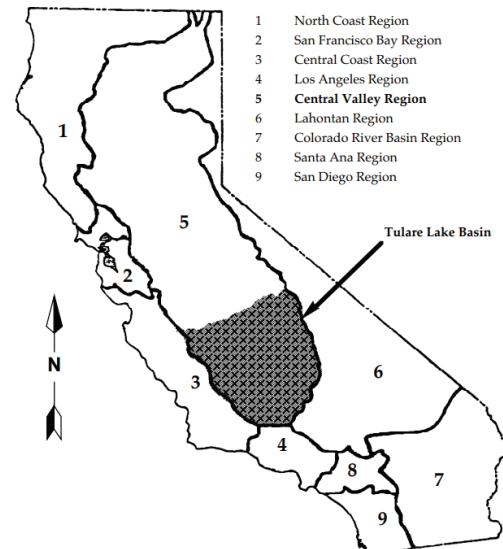
The majority of the native surface waters in the Tulare Lake Basin come from the Kings, Kaweah, Tule, and Kern Rivers. Rainfall in Kern County is highly variable both over time and across the county, with average precipitation ranging from 4–16 inches annually.⁷³ Most precipitation falls in the winter months.

Figure 48: Tulare Lake Basin Location, Regional Water Quality Control Boards

Source: California Regional Water Quality Control Board Central Valley Region⁷⁴

Agriculture has been a major driver of the economy in the southern San Joaquin Valley for decades, and irrigated agriculture currently accounts for the majority of water used in the Tulare Lake Basin.⁷⁵

The amount of farmland in production in the Central Valley doubled between the 1940s and 1960s, largely due to two inventions—the turbine pump, which increased access to groundwater in a region with limited surface



73 1981–2010 Prism Climate Group, Oregon State University. <http://prism.oregonstate.edu/>

74 Map published in the Water Quality Control Plan for the Tulare Lake Basin Second Edition, Revised July 2016. http://www.waterboards.ca.gov/centralvalley/water_issues/basin_plans/2016july_tlp.pdf

75 California Central Valley Regional Water Quality Control Board. (2014). Water Quality Control Plan for the Tulare Lake Basin.

water, and the Haber-Bosch process, which made nitrogen fertilizer cheap and readily available.⁷⁶

These changes increased pressure on groundwater reserves, leading to overdraft and land subsidence in some areas as aquifers collapsed. Public water projects were then developed in the 1950s-1970s to help reduce reliance on groundwater resources. These public water projects brought water from other parts of the state to meet the water needs of the agricultural lands in the south.⁷⁷

Today, imported surface water enters the Tulare Lake Basin through the San Luis Canal / California Aqueduct system and the Friant-Kern and Delta Mendota Canals. These water sources are of good quality but are still insufficient to completely meet the current needs of agriculture and development, so groundwater continues to be utilized to provide additional supply.⁷⁸ In the Kern River sub-basin, water pumped up with crude oil, commonly known as "produced water," also supplements the irrigation needs⁷⁹ in a small area serving the Cawello and North Kern Water Districts.⁸⁰

Challenges

Major challenges to the sustainability of water resources in the Tulare Lake Basin include overdraft of groundwater reserves, accumulation of salts, and water contamination. Irrigated agriculture plays a role in each of these challenges, though it is not the only contributing factor.⁸¹

- **Overdraft of groundwater reserves** may occur when native and imported surface water supplies are not sufficient to meet the current needs of agriculture, industry, and development. Overdraft may contribute to salt accumulation, land subsidence, and increased costs to pump water as the most accessible groundwater reserves are exhausted.
- **Salt accumulation** occurs in soils and water when irrigation water evaporates or is used by a crop (transpiration), leaving the bulk of any salts in the water behind.⁸² Though Kern County's surface waters are good quality and relatively low in salts, all irrigation water contains some dissolved mineral salts.⁸³ Imported water thus contributes more than a million tons of salt to the Tulare Lake Basin each year due to its high volume of use.^{84,85}
Prior to development, much of the Tulare Lake Basin was made up of shallow lakes and marshlands that evaporated or drained into the Delta through the San Joaquin River. Most of the surface waters that fed those wetlands have been diverted by development, however, and today the Tulare Lake Basin is a mostly closed basin with little outflow.⁸⁶
- **Water contamination** can take a variety of forms and comes from a wide range of sources. Field drainage is the primary source of water contamination from agriculture. Field drainage is excess water not used by crops or evaporated, and may carry salts, nutrients, pesticides, or other agricultural by-products into the water supply.

76 Harter, T., & Lund, J. (2012). Addressing nitrate in California's drinking water. With a Focus on Tulare Lake Basin and Salinas Valley Groundwater. *Report for the State Water Resources Control Board Report to the Legislature*. Davis, CA: UC Davis Center for Watershed Sciences. <http://groundwaternitrate.ucdavis.edu/files/138956.pdf>

77 Ibid

78 California Regional Water Quality Control Board, Central Valley Region. (2016). *Water Quality Control Plan for the Tulare Lake Basin, Second Edition*. Retrieved March 21, 2017, from http://www.waterboards.ca.gov/centralvalley/water_issues/basin_plans/2016july_tlbp.pdf

79 Ibid

80 Personal communication with Blake Sanden, UCCE Kern County, March 2017

81 California Regional Water Quality Control Board, Central Valley Region. (2016). *Water Quality Control Plan for the Tulare Lake Basin, Second Edition*. Retrieved March 21, 2017, from http://www.waterboards.ca.gov/centralvalley/water_issues/basin_plans/2016july_tlbp.pdf

82 State Water Resources Control Board. (2016). Groundwater Information Sheet – Salinity. Retrieved March 21, 2017, from http://waterboards.ca.gov/gama/docs/coc_salinity.pdf

83 University of California Agriculture and Natural Resources. (2002). Irrigation, Water Salinity, and Crop Production. Retrieved March 21, 2017, from <http://vric.ucdavis.edu/pdf/Irrigation/IrrigationWaterSalinityandCropProduction.pdf>

84 Central Valley Regional Water Quality Control Board Watershed Management Initiative. (2002). State of the Watershed Report – Tulare Lake Watershed. Retrieved March 21, 2017 from http://www.waterboards.ca.gov/centralvalley/water_issues/watershed_management/10tulare.pdf

85 California State Water Resources Control Board. (n.d.). Overview of Salinity Issues in the Central Valley. Retrieved March 21, 2017, from http://www.swrcb.ca.gov/rwqcb5/water_issues/basin_plans/cvwb_it_pub_wkshp/salt_staff_rpt.pdf

86 Sholes, D. (2006). Lithology and Groundwater Conditions in the Tulare Lake Basin. Central Valley Regional Water Board. Retrieved March 21, 2017, from http://www.swrcb.ca.gov/rwqcb5/about_us/tb_hydrogeology.pdf

INDICATOR 3.3.1 Dissolved nitrate in Kern County water systems

Background

Nitrogen is a natural element that occurs in many forms and is a critical nutrient to living organisms. It is found in the Earth's atmosphere, oceans, soils, and rocks.

Nitrate is a water soluble form of nitrogen that is produced both naturally and through human activities. In the food system, two major sources of nitrates are crop fertilizer and animal manure.

In addition to being one of the most important plant nutrients, nitrate is also one of the most common chemical groundwater contaminants in the world.⁸⁷ Nitrate moves easily in water and is then difficult and expensive to remove.⁸⁸ At high levels it can cause health problems, particularly in infants, and is regulated by the California Department of Public Health as a drinking water contaminant.

The drinking water standard, or maximum contaminant level (MCL), for nitrates in California is 45 mg/L.⁸⁹ Only drinking water is legally required to meet this standard, but it is used as a common reference level when examining nitrate levels in ground and surface water as well.

MEASURE 1: Dissolved nitrate detected in Kern County surface water

Background

Surface waters include native rivers, streams and lakes. In the Southern Central Valley, imported water flowing through canals and aqueducts is another common type of surface water. Surface waters may contain water from precipitation, surface runoff, groundwater discharge, release from watershed storage, and human sources.⁹⁰

Although surface waters can become contaminated with nitrate, this is uncommon in arid regions like Kern County, where natural precipitation is less likely to produce surface runoff from agricultural fields than in other parts of the country.

Surface waters in Kern County are generally of high quality and have low levels of salts and other contaminants, including nitrates.

Kern County Trends

Surface waters in Kern County do not contain nitrate at levels of public health concern.

Figure 49 shows the levels of nitrate detected at California Department of Water Resources surface water monitoring stations between 1972 and 2013. During the almost 40 year period included here, there was never a sample taken that exceeded the California drinking water standard of 45 mg/L. Figure 49 shows both the average level in all samples and the highest level detected that year.

A full list of surface water monitoring stations is included in Appendix G.

⁸⁷ Spalding, R. F., & Exner, M. E. (1993). Occurrence of nitrate in groundwater—a review. *Journal of environmental quality*, 22(3), 392-402.

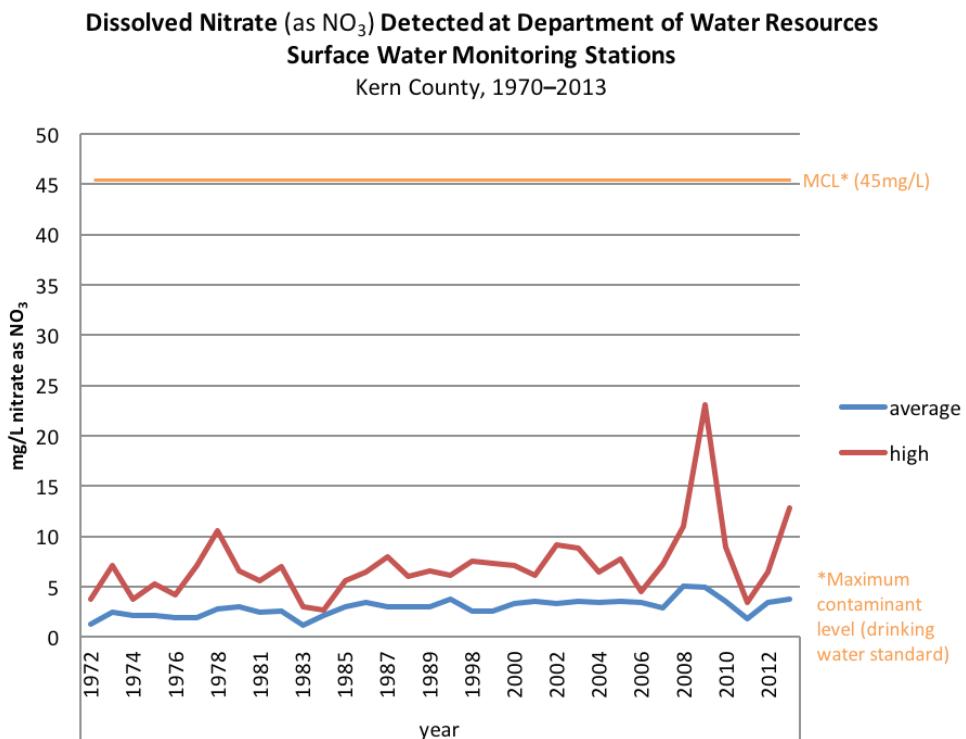
⁸⁸ California State Water Resources Control Board. (2016). Groundwater Info Sheet – Nitrate. Retrieved March 21, 2017, from http://www.waterboards.ca.gov/gama/docs/coc_nitrate.pdf

⁸⁹ Nitrate levels may be expressed as either NO_3 or $\text{NO}_3\text{-N}$. The MCL for NO_3 is 45 mg/L. The MCL for $\text{NO}_3\text{-N}$ is 10 mg/L. These levels are equivalent. All $\text{NO}_3\text{-N}$ samples in this report have been converted to NO_3 for ease of comparison.

⁹⁰ Spahr, N. E., Dubrovsky, N. M., Gronberg, J. M., Franke, O. L., & Wolock, D. M. (2010). Nitrate loads and concentrations in surface-water base flow and shallow groundwater for selected basins in the United States, water years 1990-2006 (No. 2010-5098). US Geological Survey.

Figure 49: Dissolved nitrate detected at surface water monitoring stations in Kern County (1972–2013) (excluding tile drain samples)⁹¹

Source: California Department of Water Resources Water Data Library



MEASURE 2: Dissolved nitrate detected in Kern County groundwater

Background

Dissolved nitrate in groundwater is considered the most significant water quality challenge in the United States.^{92,93,94} The primary source of nitrate in groundwater is the use of commercial fertilizer in agricultural areas, followed by livestock waste. In developed (urban, suburban) areas, human waste is the third largest contributor.⁹⁵

Nitrate contamination of groundwater depends both on how much nitrate is going into the system and on how susceptible a particular aquifer is to contaminant transport.

Since the 1940s, the amount of nitrogen fertilizer sold in California has increased over 800 percent⁹⁶ as agricultural production in the state has grown. This has been largely due to technological advances that made both water and nitrogen fertilizer more accessible, increasing yields and leading to the expansion of irrigated cropland. Nitrogen fertilizer is a relatively low cost input (though its average cost is increasing), particularly when compared to agricultural revenues in the Central Valley.

⁹¹ The average number of surface water samples taken per year (excluding tile drain samples) was n=40. This usually represented monthly monitoring of 2–4 locations, plus additional single or double samples at additional locations in some years. The highest number of samples taken was 96 in 2013, and the lowest was 20 in 1990.

⁹² Ruddy, B. C., Lorenz, D. L., & Mueller, D. K. (2006). County-level estimates of nutrient inputs to the land surface of the conterminous United States, 1982–2001 (No. 2006-5012). US Geological Survey; Scientific Investigations Report 2006-5012;

⁹³ DeSimone, L. A., Hamilton, P. A., & Gilliom, R. J. (2009). Quality of water from domestic wells in principal aquifers of the United States, 1991–2004: overview of major findings. US Department of the Interior, US Geological Survey;

⁹⁴ Dubrovsky, N. M., Burow, K. R., Clark, G. M., Gronberg, J. M., Hamilton, P. A., Hitt, K. J., ... & Rupert, M. G. (2010). The quality of our Nation's waters-Nutrients in the Nation's streams and groundwater, 1992–2004 (No. 1350). US Geological Survey

⁹⁵ Central Coast Regional Water Quality Control Board. (2011). Water Quality Conditions in the Central Coast Region Related to Agricultural Discharges.

⁹⁶ Ibid

PHOTO CREDIT: SUSAN REEP



Young dairy cattle in Kern County.

As a result, it may be over-applied at times to help mitigate risk and ensure high yields.⁹⁷ Manure from dairies is another significant source of nitrogen in the Central Valley.

Nitrate gets into groundwater through different mechanisms, but the most common is the leaching of applied fertilizer. When water-soluble fertilizer and irrigation are both applied, excess irrigation water can leach below the root zone of the crops and make its way to the groundwater, carrying nitrates and other contaminants with it. A recent UC report suggests that almost 40 percent of the fertilizer applied in the Central Valley leaches into groundwater as nitrate.⁹⁸

There are approximately 400 square miles in the Tulare Lake Basin that contain groundwater wells with elevated nitrate levels. In Kern County, groundwater is impacted primarily in Delano, McFarland, Wasco-Shafter, Bakersfield, Maricopa, and Taft.⁹⁹ The principal sources of nitrates in the Tulare Lake Basin are irrigated agriculture and dairies.¹⁰⁰

Kern County Trends

Nitrate occurs naturally in groundwater at levels generally less than 8.9 mg/L NO₃.¹⁰¹

Figure 50 shows that over the past 23 years, groundwater sample averages in Kern County have ranged from approximately one third of this maximum natural level (2.8 in 2001) to approximately triple this level (26.7 in 2002). These fluctuations may be due to changing levels or to changing sampling locations from year to year.

Average nitrate levels during this time period never exceeded the California maximum contaminant level of 45 mg/L NO₃. The average groundwater nitrate level in 2014 in Kern County was 17.4 mg/L NO₃. There does not appear to have been a change in average annual nitrate levels in groundwater over the past two decades.

Single samples, however, have exceeded the drinking water standard in several years, including 1992, 1995, 2002, 2006, 2008, and 2010. The samples exceeding the California maximum contaminant level in these years ranged from 48.7 to 74.9 mg/L NO₃. Again, there does not appear to be a trend over time in these levels.

⁹⁷ Ibid

⁹⁸ Harter, T. (2003). Agricultural Impacts on Groundwater Nitrate, Southwest Hydrology, 8(4): 22–23, 35.

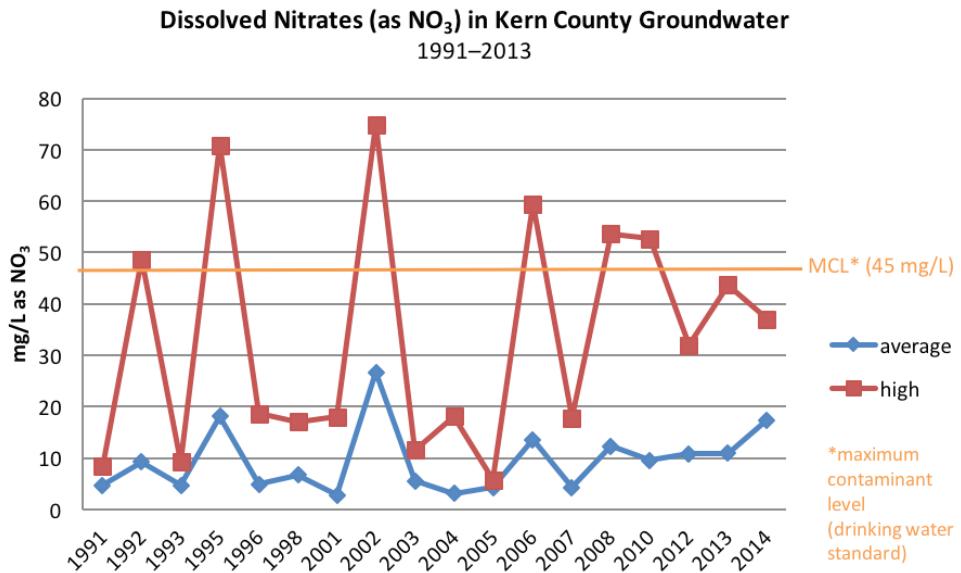
⁹⁹ Central Valley Regional Water Quality Control Board Watershed Management Initiative. (2002). State of the Watershed Report – Tulare Lake Watershed. Retrieved March 21, 2017 from http://www.waterboards.ca.gov/centralvalley/water_issues/watershed_management/10tulare.pdf

¹⁰⁰ Ibid

¹⁰¹ Central Coast Regional Water Quality Control Board. (2011). Water Quality Conditions in the Central Coast Region Related to Agricultural Discharges.

Figure 50: Dissolved nitrates (as NO₃) in Kern County groundwater (1991–2013)¹⁰²

Source: United States Geological Survey (USGS), National Water Information System (NWIS), queried via the Water Quality Portal (WQP), a collaborative tool of the National Water Quality Monitoring Council, the USGS, and the EPA.



Groundwater sampling locations, as well as the number of samples taken each year, can be viewed in Appendix H.

MEASURE 3: Nitrate maximum contaminant level (MCL) violations in Kern County public drinking water systems

Background

Most people living in California get their drinking water through public water systems. About half of this water is sourced from groundwater and half from surface water.¹⁰³ Public water systems are tested for over 90 regulated contaminants,¹⁰⁴ and at any given time, 98 percent of consumers receive safe drinking water¹⁰⁵ through these systems.¹⁰⁶ The EPA requires public notification when problems with water quality arise in public water systems.¹⁰⁷

Approximately 4 percent of Californians—or about 1.5 million people—depend on private domestic wells for drinking water.¹⁰⁸ Figure 51 shows the number of households per census tract that are dependent on private wells in California.

¹⁰² Years with fewer than 10 samples omitted from results. Number of samples taken per year ranged from 10 to 140.

¹⁰³ Shelton, J., Pimentel, I., Fram, M., & Belitz, K. (2006). Groundwater quality data in the Kern County sub-basin study unit, 2016—Results from the California GAMA program. US Geological Survey & California State Water Resources Control Board.

¹⁰⁴ Environmental Protection Agency. (n.d.). Public Notification Rule. Retrieved March, 21, 2017, from <https://www.epa.gov/dwreginfo/public-notification-rule>

¹⁰⁵ Water that meets federal and state quality standards

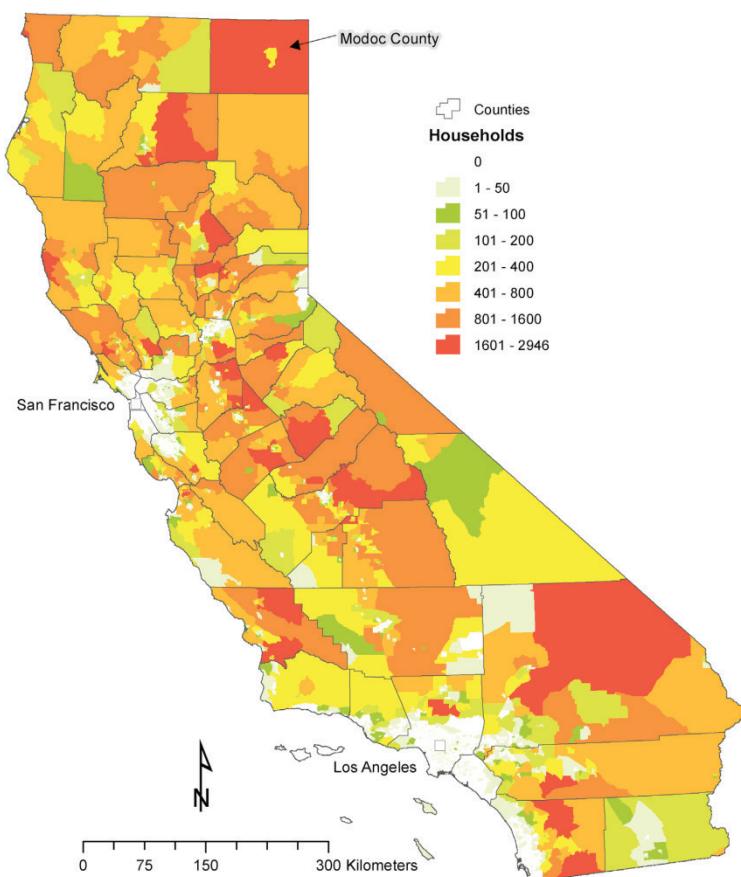
¹⁰⁶ California Water Board. (2015). Safe drinking water plan for California: Report to the legislature. Retrieved March 22, 2017, from http://www.waterboards.ca.gov/publications_forms/publications/legislative/docs/2015/sdwp.pdf

¹⁰⁷ Environmental Protection Agency. (n.d.). Public Notification Rule. Retrieved March, 21, 2017, from <https://www.epa.gov/dwreginfo/public-notification-rule>

¹⁰⁸ Johnson, T., & Belitz, K. (2015). Identifying the location and population served by domestic wells in California. *Journal of Hydrology: Regional Studies*, 3, 31–86

Figure 51: Number of households per census tract using a domestic well for drinking water source (Kern County circled)

Source: Johnson, T., & Belitz, K. (2015). Identifying the location and population served by domestic wells in California. *Journal of Hydrology: Regional Studies*, 3, 31–86. (1990 US Census question code H023: Source of Water, reported as "Individual Well")



In the U.S., domestic wells are more than twice as likely as public water systems to exceed public drinking water standards for nitrates. These wells are shallower on average than wells serving public water systems, and are more likely to be in close proximity to agricultural land.¹⁰⁹

Of the 7,600 public water systems in California, 63 percent are considered small, meaning they include fewer than 200 service connections.¹¹⁰ Small drinking water systems, like domestic wells, are more likely to be found in rural communities and less likely to meet public drinking water standards—less than 50 percent of small systems meet drinking water standards for all contaminants at all times.¹¹¹ This is particularly true of water systems that serve disadvantaged communities.¹¹² These small water systems are overseen by local county health departments, while larger systems are regulated at the state level.

109 Dubrovsky, N., Burow, K., Clark, G., Gronberg, J., Hamilton, P., Hitt, K., ... & Rupert, M. (2010). Nutrients in the Nation's Streams and Groundwater, 1992–2004, Circular 1350. *US Geological Survey, Reston, VA, USA*.

110 California Water Board. (2015). Safe drinking water plan for California: Report to the legislature. Retrieved March 22, 2017, from http://www.waterboards.ca.gov/publications_forms/publications/legislative/docs/2015/sdwp.pdf.

111 California Department of Health Services–Office of Drinking Water. (1993). Drinking water into the 21st century: safe drinking water plan for California. Retrieved November 7, 2017, from https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/dwdocuments/DrinkingWaterintothe21stCenturySafeDrinkingWaterPlanforCA.pdf

112 California Water Board. (2015). Safe drinking water plan for California: Report to the legislature. Retrieved March 22, 2017, from http://www.waterboards.ca.gov/publications_forms/publications/legislative/docs/2015/sdwp.pdf

While domestic wells are not regularly monitored for nitrate or other contaminants,¹¹³ drinking water quality data is available for public water systems of all sizes through the EPA's Safe Drinking Water Information System (SDWIS).

Public health guidelines for drinking water quality are expressed in terms of Maximum Contaminant Levels, or MCLs. An MCL is a legally enforceable water quality standard for a given contaminant. The California MCL for nitrate is 45 mg/L.¹¹⁴ MCLs apply to water that is delivered to consumers, which has typically been treated, disinfected, or sometimes blended with other water sources to achieve acceptable water quality.¹¹⁵

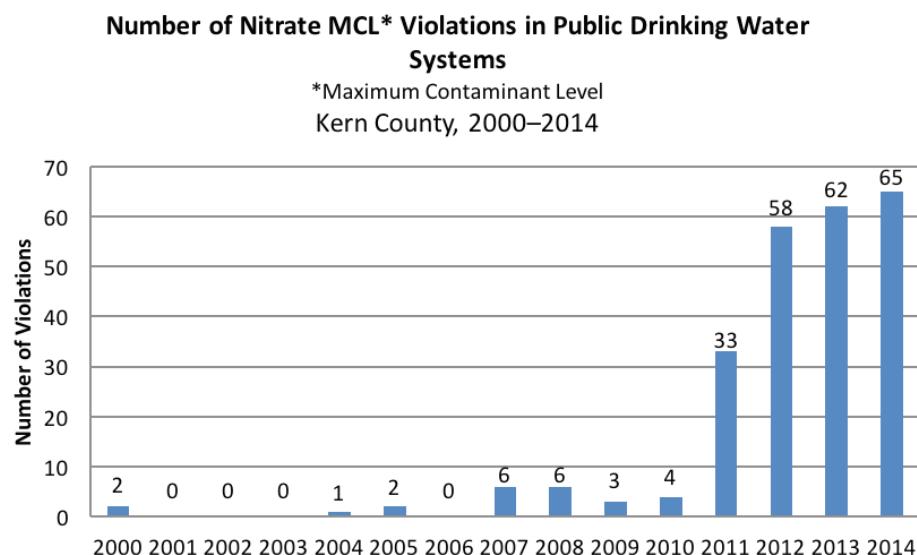
Kern County Trends

In Kern County, the majority of water systems rely primarily on groundwater.^{116, 117} There are 342 active water systems in the county,¹¹⁸ and these systems are monitored regularly¹¹⁹ for drinking water contaminants, including nitrate.

Figure 52 shows the total number of drinking water samples in Kern County that exceeded the MCL for nitrate each year. In all cases where drinking water tested above the MCL for nitrate, the primary water source for that system was groundwater.¹²⁰

Figure 52: Total number of nitrate maximum contaminant level (MCL) violations in public drinking water systems in Kern County (2000–2014)

Source: U.S. Environmental Protection Agency, Safe Drinking Water Information System (SDWIS)



¹¹³ With the exception of a handful of county-level studies, data for nitrate levels in private wells in California are not publicly available. Source: Central Coast Regional Water Quality Control Board. (2011). Water Quality Conditions in the Central Coast Region Related to Agricultural Discharges. Retrieved 11/14/17 from https://www.waterboards.ca.gov/centralcoast/board_info/agendas/2011/march/item_14/14_att7.pdf

¹¹⁴ Nitrate levels may be expressed as either NO₃ or NO₃-N. The California Department of Public Health expresses the MCL for nitrate as NO₃ (the CA MCL is 45 mg/L). The U.S. Environmental Protection Agency expresses the MCL for nitrate NO₃-N (the U.S. MCL is 10 mg/L). These levels are equivalent, they are just expressed differently. All NO₃-N samples in this report have been converted to NO₃ for ease of comparison.

¹¹⁵ Shelton, J., Pimentel, I., Fram, M., & Belitz, K. (2006). Groundwater quality data in the Kern County sub-basin study unit, 2016—Results from the California GAMA program. US Geological Survey & California State Water Resources Control Board.

¹¹⁶ SDWIS (Safe Drinking Water Information System), data queried March 13, 2017. Query: California, Kern County, All size systems, Active Systems. 92% of systems in Kern County rely primarily on groundwater. However, some systems are very small, so this does not fully describe the origins of drinking water supplies in Kern, either in terms of total flow (in acre feet) or in terms of individuals served.

¹¹⁷ Personal communication with Jason Meadors, City of Bakersfield Water Resources Director, March 13, 2017.

¹¹⁸ The Environmental Protection Agency's Safe Drinking Water Information System (SDWIS) lists 178 community water systems (CWS), 84 non-transient non-community water systems (NTNCWS), and 80 transient non-community water systems (TNCWS) in Kern County. CWS serve the same people year-round (e.g., homes or businesses). NTNCWS serve the same people, but not year round (e.g., schools). TNCWS do not consistently serve the same people (e.g., gas stations, camp grounds).

¹¹⁹ State Water Resources Control Board, Division of Drinking Water. (2015). Annual Compliance Report. Retrieved March 22, 2017, from http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/dwdocuments/2015/2015_acr.pdf

¹²⁰ SDWIS (Safe Drinking Water Information System), data queried October 28, 2015.

All public water systems are sampled for nitrates annually and the results are uploaded to the EPA's Safe Drinking Water Information System (SDWIS).¹²¹ If a system tests above the MCL it is required to undergo additional quarterly testing until samples are less than 50 percent of the MCL for four consecutive quarters.¹²²

There are 342 active water systems in Kern County.¹²³ Though this number may vary slightly from year to year, this means that approximately between 342 and 1,368 (342 x 4) samples are taken annually to test for nitrate. The actual number of samples is likely closer to the lower end, since most water systems are in compliance with the nitrate MCL each year and would only be tested once annually.

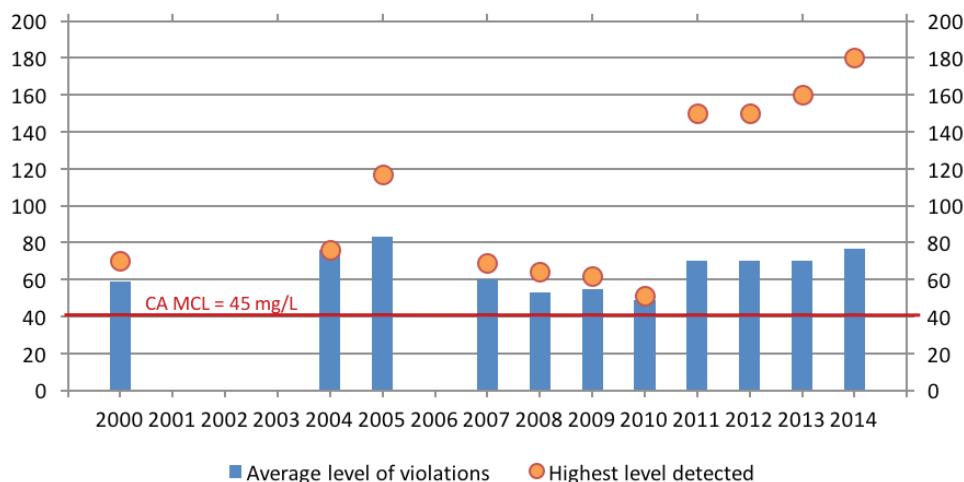
The total number of nitrate MCL violations in Kern County has increased substantially since 2011, from fewer than 10 to more than 50. However, the majority of drinking water samples (between 81–95 percent in 2014, depending on the total number of samples) are still in compliance with the public health standard for nitrate.

Figure 53 shows both the average concentration of nitrate (blue bars) and highest concentration of nitrate (orange dots) found in the MCL violations recorded that year. These are the nitrate levels found only in those water samples that exceeded the MCL, not all water samples. These samples give an idea of how much the MCL is being exceeded when violations take place, and do not represent the average nitrate levels in public water systems.

Figure 53: Concentration of nitrate found in water samples that exceeded the maximum contaminant level (MCL) in Kern County public drinking water systems (2000–2014)

Source: U.S. Environmental Protection Agency, Safe Drinking Water Information System (SDWIS)

Nitrate Levels of MCL Violations in Public Drinking Water Systems
Kern County, 2000–2014



121 State Water Resources Control Board, Division of Drinking Water. (2015). Annual Compliance Report. Retrieved March 22, 2017, from http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/dwdocuments/2015/2015_acr.pdf

122 Personal communication with the office of Jesse Dhaliwal (661-335-731) and Carly Ho at the Environmental Protection Agency (415-972-3458)

123 State Water Resources Control Board, Division of Drinking Water. (n.d.). Water Systems List. Retrieved March 22, 2017, from <https://sdwis.waterboards.ca.gov/PDWW/JSP/WaterSystems.jsp?PointOfContactType=none&number=&name=&county=Kern>

The majority of MCL violations in the last 15 years were recorded in the last three years of available data (2012–2014). During this time period, the average nitrate level of MCL violations ranged from 70 to 77 mg/L. The majority of the MCL violations during these three years occurred in Bakersfield and Weldon.

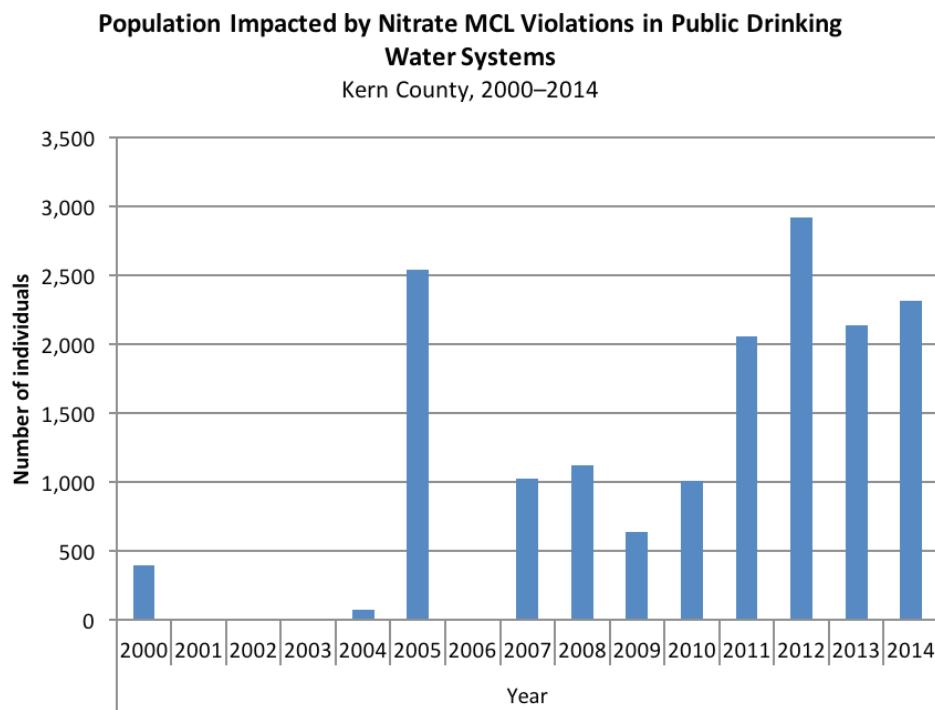
In each of these three years, there were multiple individual samples in which the nitrate level that was detected was double or triple the MCL. The majority of the MCL violations in which nitrate was detected at above 100 mg/L were in Bakersfield, Inyokern, Lamont, and Weldon.

Out of 342 active water stations in Kern County, 15 regularly exceeded the MCL for nitrate (more than 10 violations in the last 15 years). Of these systems with regular violations, all are small (fewer than 200 connections). Most serve fewer than 200 individuals and all serve fewer than 500 individuals. Approximately half of the 15 were residential water supplies and half were institutions, businesses, recreation areas, or industrial/agricultural sites.

Figure 54 shows the number of individuals each year served by drinking water systems with nitrate levels over the MCL in Kern County.

Figure 54: Population impacted by nitrate Maximum Contaminant Level (MCL) violations in Kern County public drinking water systems (2000–2014)

Source: U.S. Environmental Protection Agency, Safe Drinking Water Information System (SDWIS)



An average of 1,083 individuals per year have been served by public water systems that exceed the MCL for nitrate in Kern County over the last 15 years. This represents approximately a tenth of one percent (0.1 percent) of the total population of Kern County. The number of people impacted has been roughly double that average in the last five years (an average of 2,089 individuals per year 2010–2014), but this still represents a fraction of a percent of the total population.

INDICATOR 3.3.2 Agricultural water use in Kern County

Background

The natural rainfall in the Tulare Lake Basin falls primarily in the winter months, and is insufficient to meet the current needs of agriculture in the region. As a result, most of the region's crops are irrigated.

Irrigation is the application of water to crops by various methods. Common methods include drip, sprinkler, flood, and furrow. Irrigation has multiple beneficial uses in agriculture in addition to meeting the direct water needs of a crop. Irrigation water can be used to control soil salinity in the root zone, to protect crops from frost damage, and provide for groundwater recharge.¹²⁴ Irrigation application rates vary depending on geology, climate, crop, and irrigation method, and also take into account expected losses to evaporation or runoff. In the Central Valley, irrigation water may come from ground or surface water resources (native or imported).

The California Water Code (CWC) defines water conservation as "the efficient management of water resources for beneficial uses, preventing waste, or accomplishing additional benefits with the same amount of water."¹²⁵ In the context of agriculture, this often means increasing water productivity, which is usually expressed as the crop yields produced by each unit of water, or in the common vernacular, "crop per drop."

Over the past four decades, California has improved water delivery and management practices, increasing yields and economic returns while reducing the total water applied to crops by more than 5 percent.¹²⁶ The economic return on agricultural water use has nearly doubled during the same time period, from \$651 per acre-foot in 1967 to \$1280 per acre-foot in 2010.¹²⁷ Many factors impact agricultural productivity and value, including plant breeding for improvement, fertility management, pest control, crop selection, and market conditions. Each of these factors may have contributed to rising economic returns on water use in addition to improvements in efficiency.

Efficient management of water resources is rarely as simple as reducing the amount of irrigation water applied at the field level. Though higher efficiency irrigation methods (like drip and micro-sprinkler) may reduce the water applied to a field, efficiency can also mean producing higher yields with the same amount of water.

Also, farming cannot be isolated from the environment in which it takes place. A prominent characteristic of California agriculture is the reuse of water for multiple beneficial purposes, both on and off-farm.¹²⁸ Water that is "lost" at the field level may be used for a different purpose at another level. For example, water that runs off of one field may be collected and reused on another field or at another farm. Also, water that is "lost" to agricultural use may benefit the regional water basin by recharging groundwater or feeding into wildlife habitat.

In this context, protecting water quality may be more important than reducing the amount that is used, particularly in agricultural systems where water is often reused many times.

Although there are clear benefits associated with agricultural water use, there are also costs. Irrigation contributes to several of the water quality challenges in the Central Valley, including overdraft of groundwater, land subsidence, salt accumulation, and water contamination. In this section we will look at trends in agricultural water use in Kern County over time.

124 Hanson, B. (2009). California Agriculture, Water, and You. Davis, California: University of California, Davis. Retrieved March 22, 2017, from http://www.pge.com/includes/docs/pdfs/shared/edusafety/training/pec/water/blaine-hanson_water_forum_complete.pdf

125 California Water Code, Section 10817

126 California Department of Water Resources. (2016). Agricultural Water Use Efficiency: A Resource Management Strategy of the California Water Plan.

127 Adjusted to 2010 dollars. "Comparing Changes in Applied Water Use and the Real Gross Value of Output for California Agriculture: 1967 to 2010" contained in the Update 2013 Water Plan Update Volume 4 Reference Guide

128 California Department of Water Resources. (2016). Agricultural Water Use Efficiency: A Resource Management Strategy of the California Water Plan. Retrieved March 22, 2017, from http://www.water.ca.gov/waterplan/docs/rms/2016/01_Ag_Water_Efficiency_July2016.pdf

California Almond Sustainability Program (CASP)

The California Almond Sustainability Program (CASP), led by the Almond Board of California, is an online education portal dedicated to helping growers improve efficiencies and to demonstrate sustainable almond-production practices to buyers, regulators, and consumers. Through the CASP portal, almond growers and handlers can complete self-assessment modules, use decision support tools, and learn about alternative practices and best practices to help them optimize their environmental, economic, and social performance.

Kern County almond growers are showing good levels of participation in CASP. Since the creation of the CASP SustainableAlmondGrowing.org website in 2009, 130 Kern County almond orchards — totaling 51,007 bearing acres, or about 15% of all Kern County almond acreage — has been assessed online. These Kern County growers are using many of CASP's key practices, with over 90% using recommended practices promoting bee health and pollination, over 84% using key recommended air stewardship practices, and over 70% using key water stewardship practices, including deficit irrigation.



Almonds in bloom, Kern County.

PHOTO CREDIT: SUSAN REEP

MEASURE 1: Acreage of irrigated agriculture in Kern County

Background

Approximately 800,000 acres of cropland are irrigated in Kern County, or approximately one third of all agricultural lands.¹²⁹ The majority of non-irrigated farmland is in rangeland use.¹³⁰ Depending on the year, Kern County crops require between 200,000 and 1 million more acre feet of water than is available through surface waters (native and imported). This deficit is supplied by groundwater pumping.¹³¹

Water for irrigation is the most expensive component of Kern County agriculture, costing from \$80 to \$1500 per acre-foot, depending on the water district, depth to groundwater and the need to buy "emergency pool" water through the CA Department of Water Resources during the last five years of drought.¹³² Recent studies have shown that irrigation in Kern County is highly efficient at the field level, with efficiency levels averaging 95 percent.¹³³

Water use depends on multiple factors, including crop type and growth stage, irrigation type, and geologic and climate conditions.

129 USDA Census of Agriculture

130 Kern County Crop Reports, Kern County Agricultural Commissioner

131 Sanden, B. (2008). How Good Is Water Use Efficiency in California Agriculture? Kern County University of California Cooperative Extension.

132 Personal communication, B. Sanden, March 2017

133 Sanden, B., Hockett, B., & Enzweller, R. (2003). Soil moisture sensors and grower "sense" abilities: 3 years of irrigation scheduling demonstrations in Kern County. In Proc. Tech. Conf. of the Irrigation Assoc., San Diego, CA (pp. 242-250).

Kern County Trends

Figures 55a and 55b show trends in the total acres of irrigated and non-irrigated farmland in Kern County and California, respectively. At both the county and state level, total acres of farmland are decreasing while acres of irrigated agriculture have remained relatively stable. As a result, irrigated farmland as a percentage of all farmland is increasing, as shown in Figure 55c.

Figure 55a: Total acres of irrigated and non-irrigated farmland in Kern County (1982–2012)

Source: USDA Census of Agriculture

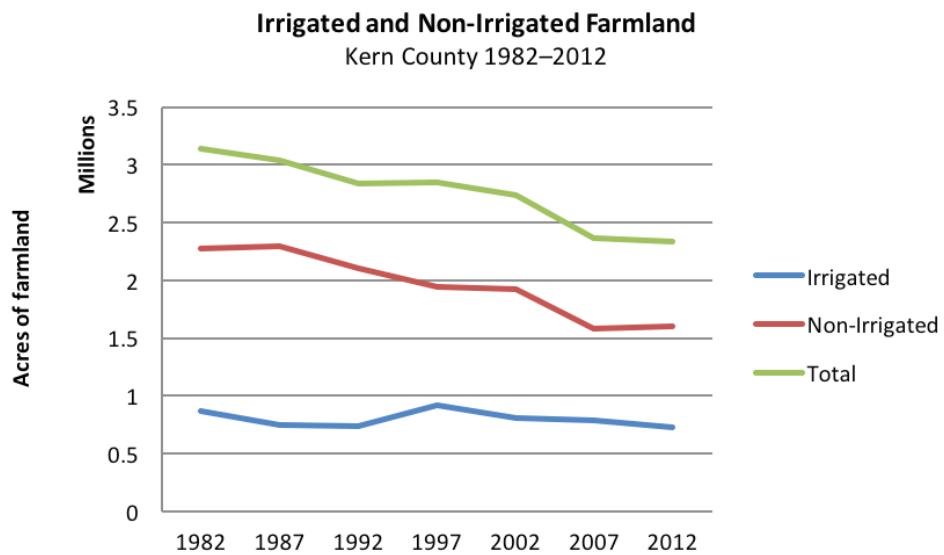


Figure 55b: Total acres of irrigated and non-irrigated farmland in California (1982–2012)

Source: USDA Census of Agriculture

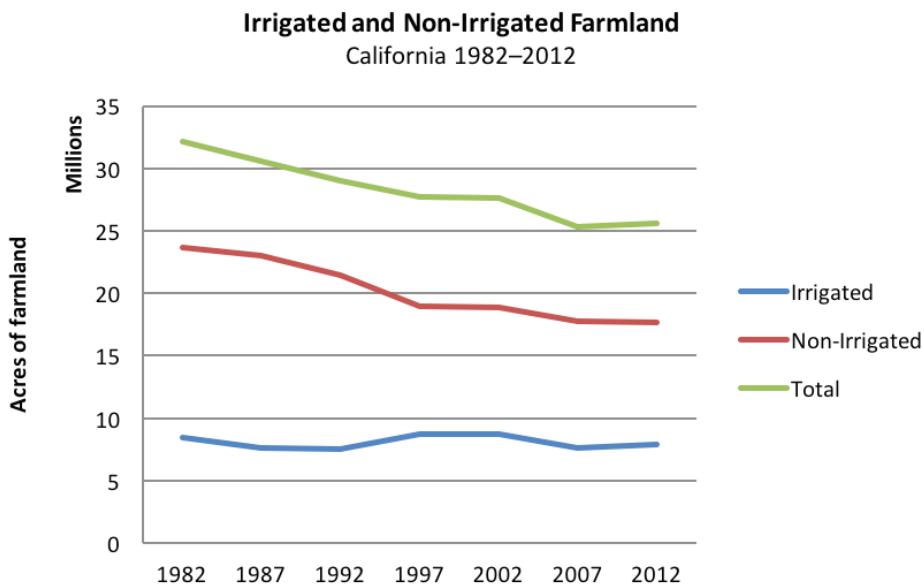
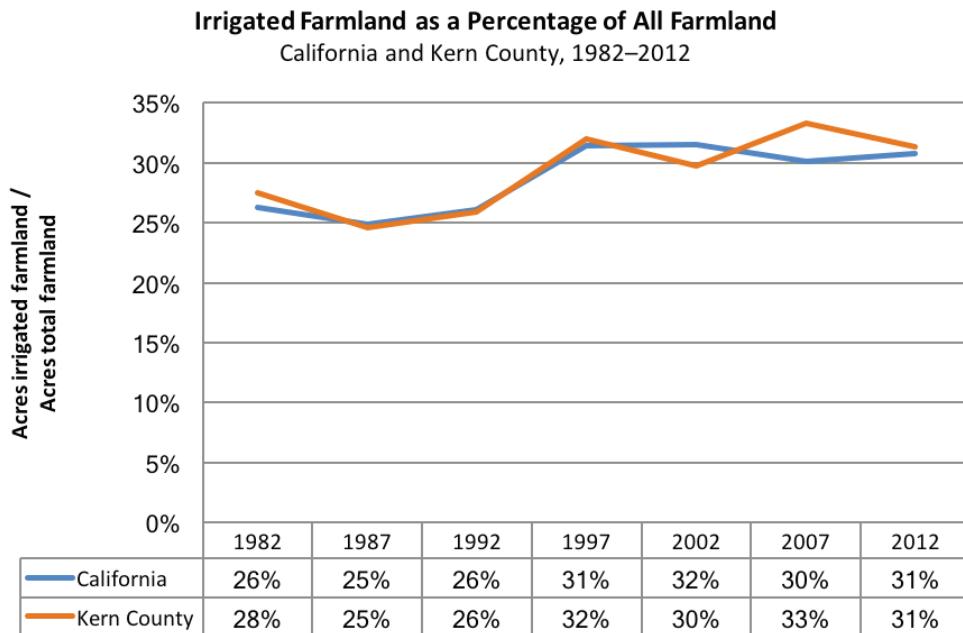


Figure 55c: Irrigated farmland as a percentage of all farmland in California and Kern County (1982–2012)

Source: USDA Census of Agriculture



MEASURE 2: Average water requirements of harvested crops in Kern County

Background

A common method of estimating the water requirement of a crop is to look at that crop's theoretical annual evapotranspiration (ET_c). This is the amount of water the crop needs to live and grow. This does not take into account other beneficial uses of irrigation, like flushing salts from the crop root zone, and it does not take into account different methods of irrigation. For example, a crop's water needs could be met by flooding a field, in which case a large amount of water is applied every 10 to 14 days, or by precision drip irrigation applied every one to four days.

Cropping patterns have changed in Kern County over time. Figure 56 shows a sharp increase in the acres harvested of fruit and nut crops in Kern County over the last 15 years, accompanied by a decrease in field and rangeland crops and a slight decrease in vegetable crops.

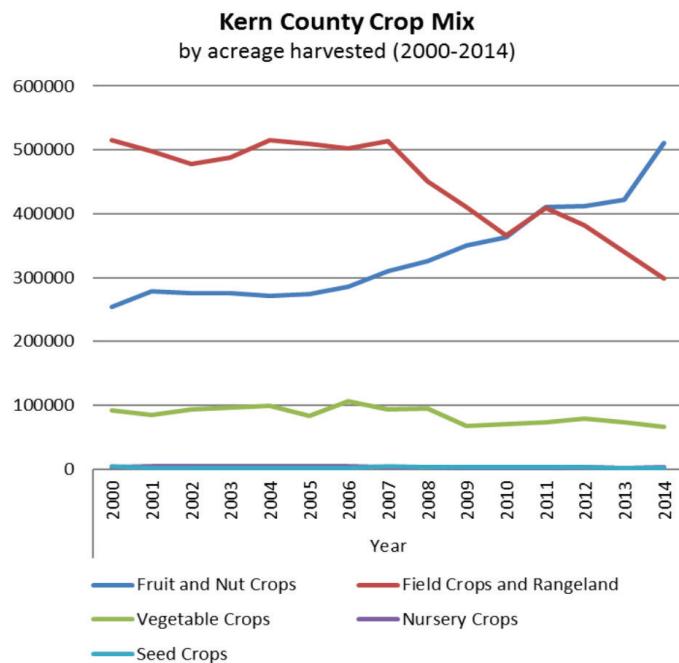


PHOTO CREDIT: DOUG KESSLER



Figure 56: Kern County crop mix by acres harvested (2000–2014)

Source: Kern County Agricultural Commissioner's Annual Crop Reports



Although there is evidence that irrigation efficiency in the Central Valley is high and increasing,¹³⁴ particularly in the high value orchard crops that are expanding in Kern County,¹³⁵ concerns are still sometimes raised that changing crop patterns may lead to increased or unsustainable demands on the water system. Analyzing Kern County's overall water system sustainability is beyond the scope of this assessment, but we can look at the average theoretical water needs of the crops in Kern County over time.

¹³⁴ Sanden, B., Hockett, B., & Enzweller, R. (2003). Soil moisture sensors and grower "sense" abilities: 3 years of irrigation scheduling demonstrations in Kern County. In *Proc. Tech. Conf. of the Irrigation Assoc., San Diego, CA* (pp. 242-250).

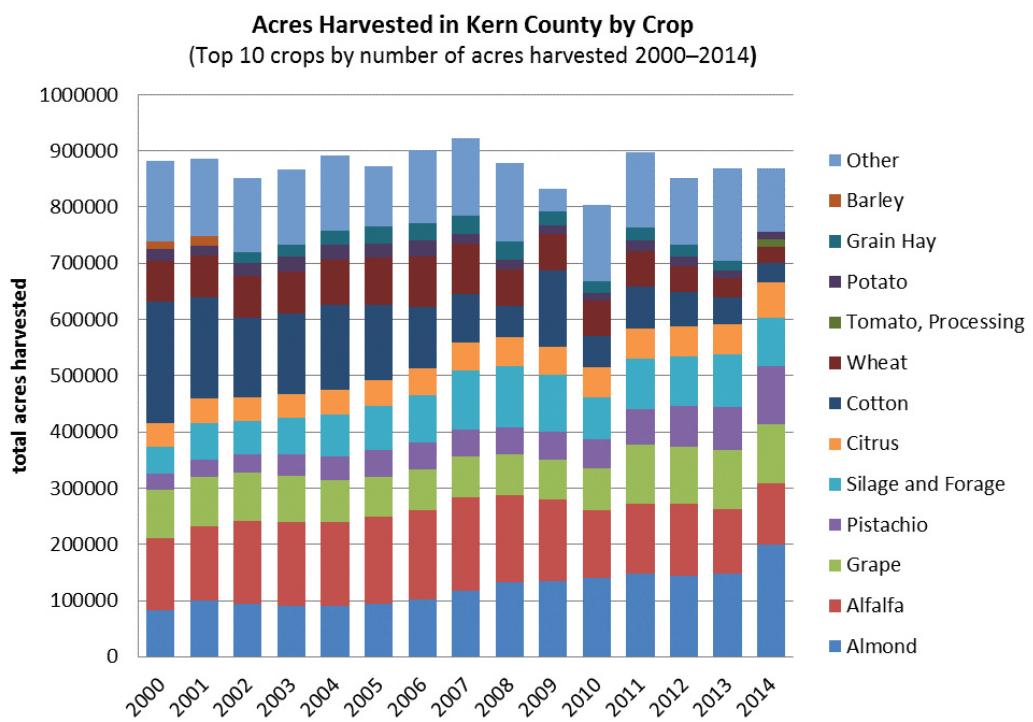
¹³⁵ Hanson, B. (2009). California Agriculture, Water, and You. Davis, California: University of California, Davis. Retrieved March 22, 2017, from http://www.pge.com/includes/docs/pdfs/shared/edusafety/training/pec/water/blaine-hanson_water_forum_complete.pdf

Kern County Trends

Figure 57 shows the top 10 crops by number of acres harvested over the past 15 years in Kern County.¹³⁶ The crops make up more than 80 percent of the crops harvested in Kern County in any given year.

Figure 57: Top crops in Kern County by acres harvested (2000–2014)

Source: Kern County Agricultural Commissioner's Annual Crop Reports



In order to estimate the water requirements of these top crops, we used ETc values (expressed in acre-inches per year) for each crop, multiplied by the number of harvested acres of that crop. The ETc values used for each crop can be found in Appendix I. Figure 58 shows the estimated water requirements of the top 10 crops in Kern County over time.¹³⁷

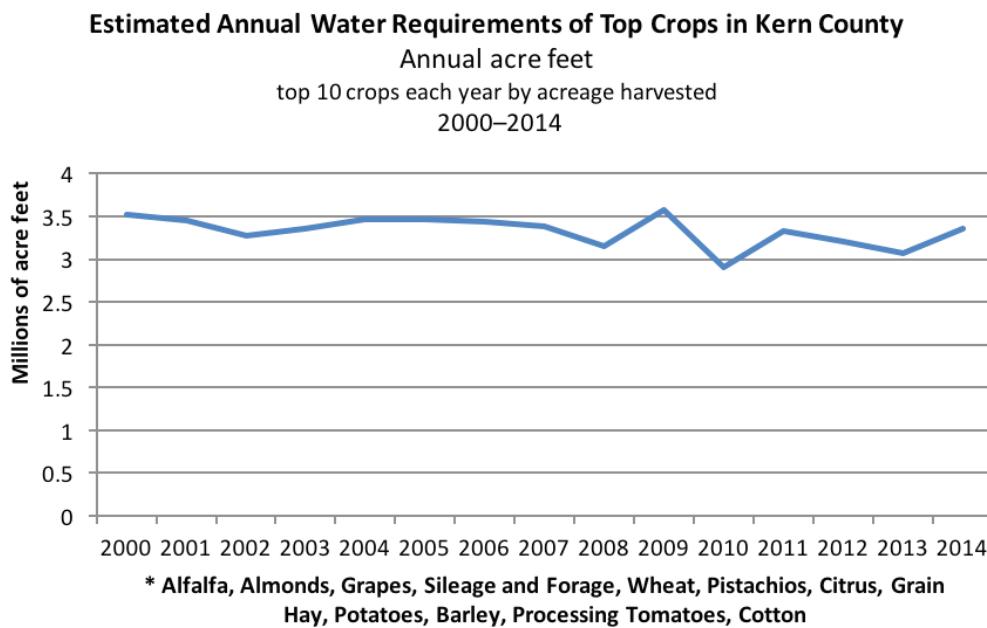
¹³⁶ Rangeland harvested acreage is excluded, as it represents a large number of acres but is not typically irrigated.

¹³⁷ Limitations of this method of estimating water requirements include: (1) it is a theoretical calculation, not a measured observation; (2) it does not account for efficient versus inefficient water delivery; (3) it does not account for acres that are irrigated but not harvested (for example, young orchard crops).

Figure 58: Estimated annual water requirements in acre feet¹³⁸ of the top 10 crops in Kern County (2010–2014)

Source for top crops by acres harvested: Kern County Agricultural Commissioner's Annual Crop Reports

Source for crop annual evapotranspiration: California Polytechnic State University's Irrigation Training and Research Center, Report NO. R 03-001¹³⁹



There has been no statistically significant change in the estimated water required to grow Kern County's top crops over the past 15 years even though cropping patterns have changed.

ET models typically overestimate water use¹⁴⁰ (3–3.5 million acre-feet annually using our calculation, which was based on dry year estimates), but because this overestimation is consistent over time, it can be used to establish trends. The Kern Water Agency and UC Cooperative Extension office in Kern County estimates that Kern County actually uses 2–2.4 million acre-feet of water per year for agriculture.¹⁴¹

GOAL 3.4 Kern County's food systems workers are part of a safe and fair work environment

Background

In addition to providing food to local, national, and international markets, the U.S. food system is also the largest source of jobs in the country, employing one in seven workers nationally.¹⁴² In Kern County, the food system employs one out of every three workers, more than double the national average (See Vision 2, Goal 2.3).

¹³⁸ Annual acre feet = total acres harvested for each crop x crop annual evapotranspiration (converted from acre inches to acre feet)

¹³⁹ Estimates based on crop dry year evapotranspiration, average of Zones 14 and 15. Kern County contains Zones 10, 12, 14, 15, 16, 17, but the majority of agricultural activity is in Zones 14 and 15.

¹⁴⁰ California Department of Water Resources. (2016). Agricultural Water Use Efficiency: A Resource Management Strategy of the California Water Plan.

¹⁴¹ UC Cooperative Extension, Kern County. (n.d.). Irrigation Management and Agronomy. Retrieved March 22, 2017, from http://ce kern.ucanr.edu/Irrigation_Management/

¹⁴² Food Chain Workers Alliance and Solidarity Research Cooperative. (2016). No Piece of the Pie: U.S. Food Workers in 2016. Los Angeles, CA: Food Chain Workers Alliance.

Food systems workers include farmers and farmworkers, restaurant workers, packers and distributors, food manufacturing workers, food retail workers, and others. Although employment in the food system is growing, wages remain low and food systems workers are twice as likely as workers in other industries to be food insecure.¹⁴³ There are also greater race and gender disparities in pay in the food system than in the broader economy, with women of color earning less than half the wages of their white male counterparts (see Table 9).

Table 9: Gender and race wage ratio in the U.S. food system and U.S. economy

Sources: Food systems ratios from No Piece of the Pie, Food Chain Workers Alliance 2016

U.S. economy ratios from U.S. Census Bureau American Community Survey 2015

Ratios based on median household income. Each ratio is relative to earnings by white male workers in the food system and the U.S. economy, respectively.¹⁴⁴

Wage Ratio (based on median household income)		
	Food system	U.S. Economy
Native women	0.36	0.59
Black women	0.42	0.63
Native men	0.44	0.65
Latina women	0.45	0.54
White women	0.47	0.75
Asian women	0.58	0.90
Black men	0.60	0.72
Latino men	0.76	0.62
Asian men	0.81	1.08
White men	1.00	1.00

See *Vision 2, Goal 2.3: The Kern County food system provides job opportunities*, for details on food systems wages in Kern County.

In addition to low wages, food systems workers face a number of occupational hazards, particularly those workers that are involved in the production of food.

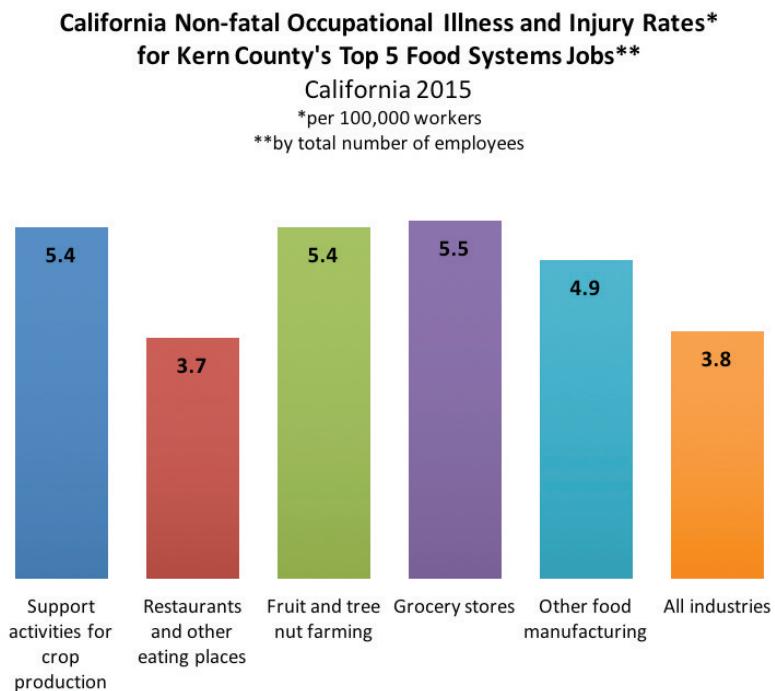
Figure 59 shows the California rates of occupational illness and injury per 100,000 workers in the top five food systems jobs types in Kern County by total number of workers. With the exception of restaurant workers, rates in these food systems jobs are substantially higher than California's all-industry average. For context, the 2015 rate for construction was 3.3, transportation and warehousing was 5.7, and mining, quarrying, and oil and gas extraction was 0.7.

143 Ibid

144 The wage ratios in this table can only be used to compare gender and race-based wage gaps within the food system to gender and race-based wage gaps in the economy overall, NOT average wages between the food system and the wider economy.

Figure 59: California non-fatal occupational illness and injury rates for Kern County's top five food systems jobs by number of employees (rate per 100,000 workers)

Source: Bureau of Labor Statistics, California Nonfatal occupational injuries and illnesses data by industry (SOII)



At the national level, rates of injury and illness in the food system have risen, even as they have decreased across most other industries.¹⁴⁵

A 2012 national survey of food systems workers found that 57 percent of food systems workers were born outside the U.S., and up to 20 percent are undocumented.¹⁴⁶

Among farmworkers, approximately two thirds are immigrants and 50 percent are not legally authorized to work in the United States.¹⁴⁷ In California, more than 90 percent of farmworkers were born outside the U.S., primarily in Mexico. A lower percentage of California farmworkers are authorized to work in the U.S. compared to the national average (44 percent versus 54 percent).¹⁴⁸ (See Figures 60 and 61)

¹⁴⁵ Food Chain Workers Alliance and Solidarity Research Cooperative. (2016). No Piece of the Pie: U.S. Food Workers in 2016. Los Angeles, CA: Food Chain Workers Alliance.

¹⁴⁶ Food Chain Workers Alliance. (2012). The Hands That Feed Us. Los Angeles, CA: Food Chain Workers Alliance.

¹⁴⁷ United States Department of Agriculture, Economic Research Service. (2016). Farm Labor Background. Retrieved March 29, 2017, from <https://www.ers.usda.gov/topics/farm-economy/farm-labor/background.aspx>

¹⁴⁸ National Agricultural Workers Survey (NAWS). Retrieved March 29, 2017, from <https://www.doleta.gov/agworker/naws.cfm>

Figure 60: Farmworkers in California and the U.S. by place of birth (1989–2014)

Source: National Agricultural Workers Survey (NAWS), Table 1: National Demographic Characteristics and Table 2: California Demographic Characteristics

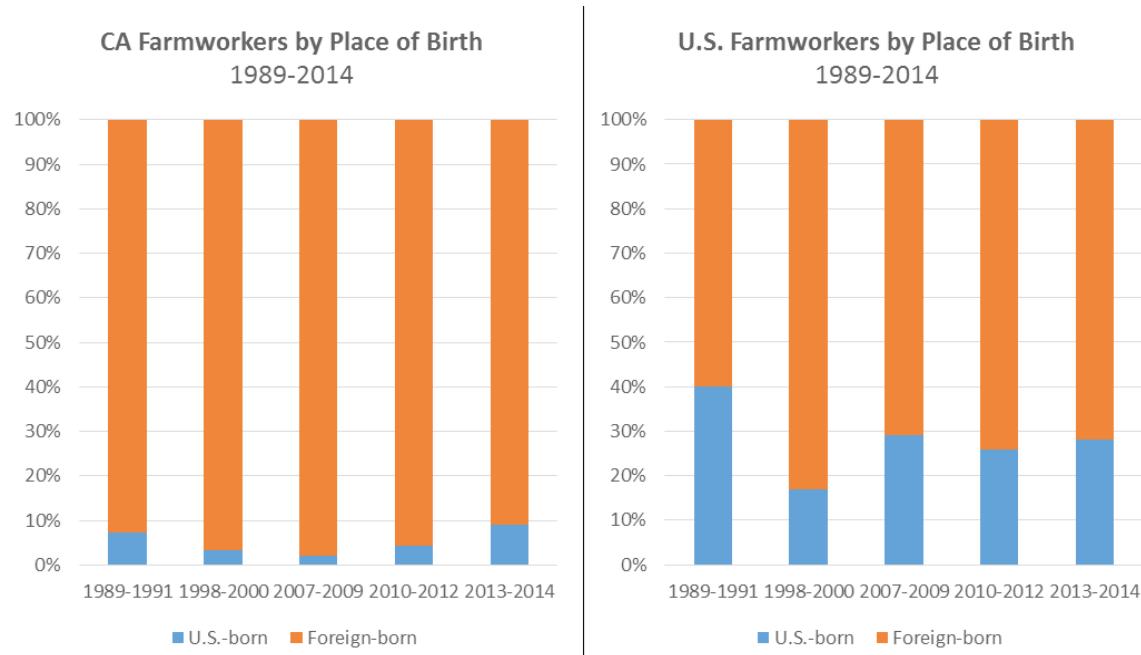
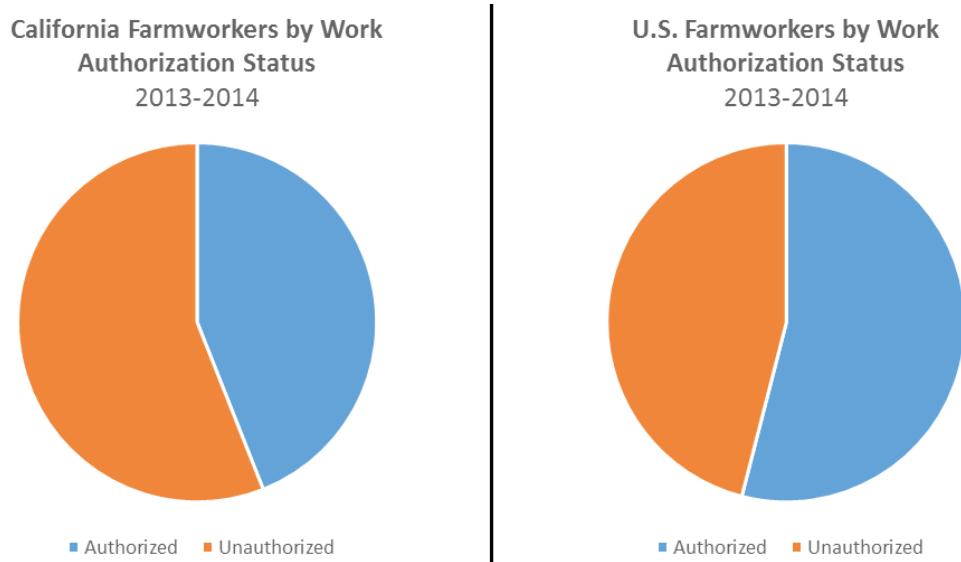


Figure 61: Farmworkers in California and the U.S. by work authorization status (1989–2014)

Source: National Agricultural Workers Survey (NAWS), Table 1: National Demographic Characteristics and Table 2: California Demographic Characteristics



Immigrant and undocumented farmworkers are particularly vulnerable in the workplace. Undocumented workers earn lower wages on average than other workers, and are more than twice as likely to experience wage theft.¹⁴⁹ They are also more likely to be injured on the job and less likely to have

149 Food Chain Workers Alliance. (2012). *The Hands That Feed Us*. Los Angeles, CA: Food Chain Workers Alliance.

any form of insurance, including health or unemployment insurance, to help mitigate risk.¹⁵⁰ Undocumented workers may have limited English or even Spanish language skills, fewer alternative job options, and lower levels of education or social support. As a result, they may be more likely to take risks and less likely to complain about treatment or conditions.¹⁵¹ They are also less likely to report injuries or accidents when they do occur.¹⁵² Additional occupational risks of farm work include those associated with low food security, like diabetes, and risks associated with substandard housing and close proximity to agricultural hazards like pesticides or nitrates in drinking water.

Statistics of farmworker demographics and working conditions are collected by the U.S. Bureau of Labor Statistics through the National Agricultural Workers Survey (NAWS), but are not currently available by county. Workplace injuries and illnesses are monitored by the U.S. Department of Labor's Occupational Safety and Health Administration (OSHA). OSHA enforcement data includes the number of inspections, violations, and accidents and can be queried by state or by zip code. Rates of non-fatal occupational injuries and illnesses by industry are available at the state and national level through the Survey of Occupational Illness and Injury (SOII). Rates of fatal occupational injuries are available at the state and national level through the Census of Fatal Occupational Injuries (CFOI). Pesticide related illnesses are monitored in California by the California Pesticide Illness Surveillance Program. The U.S. Department of Labor's Wage and Hour Division (WHD) monitors and enforces compliance with the Fair Labor Standards act, including minimum wage, overtime pay, recordkeeping, and child labor law.

INDICATOR 3.4.1 Injuries, illnesses, and fatalities among agricultural workers in Kern County

Background

Agricultural workers face a range of hazards in the workplace. These may include working with heavy machinery or above the ground, working outdoors in extreme weather, or handling hazardous materials.

Common health and safety issues for farmworkers include:

- **Vehicle hazards.** Half of workplace injuries on farms are the result of an accident involving a vehicle.¹⁵³ This includes tractor incidents, which are the leading source of farm injuries and deaths.¹⁵⁴
- **Heat illness.** Working outdoors in hot and humid conditions can lead to heat related illness and fatalities. Workers most at risk are those doing heavy tasks, wearing bulky protective equipment, and new workers who have not yet acclimated to the heat.
- **Ladders and falls.** Falls are a common source of injury in many industries, however rates among agricultural workers are particularly high.¹⁵⁵
- **Musculoskeletal injuries.** These can be caused by repetitive motions, prolonged awkward positions, or heavy lifting. Exposure to cold and vibration (such as from heavy machinery) may worsen these risks.¹⁵⁶ Injuries may be acute or chronic.

150 Schenker, M. (2017). The health of immigrant farmworkers. Campus Community Book Project Public Lecture, University of California Davis.

151 Ibid

152 U.S. House of Representatives, Committee on Education and Labor. (2008). Hidden Tragedy: Underreporting of Workplace Injuries and Illnesses. Retrieved May 1, 2017 from <https://www.bls.gov/iif/laborcomreport061908.pdf>

153 United States Department of Labor, Occupational Safety and Health Administration. (n.d.). Safety and Health Topics – Agricultural Operations – Vehicle Hazards. Retrieved March 29, 2017, from <https://www.osha.gov/dsg/topics/agriculturaloperations/vehichelhazards.html>

154 Myers, M. L., Cole, H. P., & Westneat, S. C. (2008). Projected incidence and cost of tractor overturn-related injuries in the United States. *Journal of agricultural safety and health*, 14(1), 93. Centers for Disease Control and Prevention. (2004). Focus on Agriculture. In *Worker Health Chartbook*, (pp. 193–222).

155 United States Department of Labor, Occupational Safety and Health Administration. (n.d.). Safety and health topics – agricultural operations – hazards and controls. Retrieved March 29, 2017, from https://www.osha.gov/dsg/topics/agriculturaloperations/hazards_controls.html

156 Ibid

- **Hazardous equipment and machinery.** Tools that have potential to be hazardous are common in farm work, including knives, hoes, ladders, and power tools.
- **Grain bins and silos.** Suffocation is the most common hazard related to grain bins and silos, although dust exposure and explosions are also potential risks.
- **Unsanitary conditions.** Lack of sanitation facilities, including lack of clean drinking water, handwashing stations, and bathrooms, can have adverse health effects on workers.
- **Pesticide exposure.** Workers who handle pesticides directly, those who work in fields that have been treated, and the families of workers can all potentially be exposed to pesticides. Exposure to some pesticides can lead to acute or chronic illness.



PHOTO CREDIT: SUSAN REEP

Orange tree shaping, Kern County.

MEASURE 1: Occupational accidents reported to OSHA – Support activities for crop production (NAICS 1151)

Employers are required by OSHA to report any injuries that involve lost worktime, medical treatment other than first aid, restriction of work or motion, loss of consciousness, or transfer to another job through the Survey of Occupational Injuries and Illnesses (SOII).

Only those illnesses and injuries which can be easily attributed to the workplace are reported, so acute cases are included far more often than chronic ones. Farms with fewer than 11 employees are also exempt from reporting.¹⁵⁷ As a result, it is estimated that as many as three quarters of agricultural illnesses and injuries may go unreported, a significantly higher rate than in other industries.¹⁵⁸

Kern County Trends

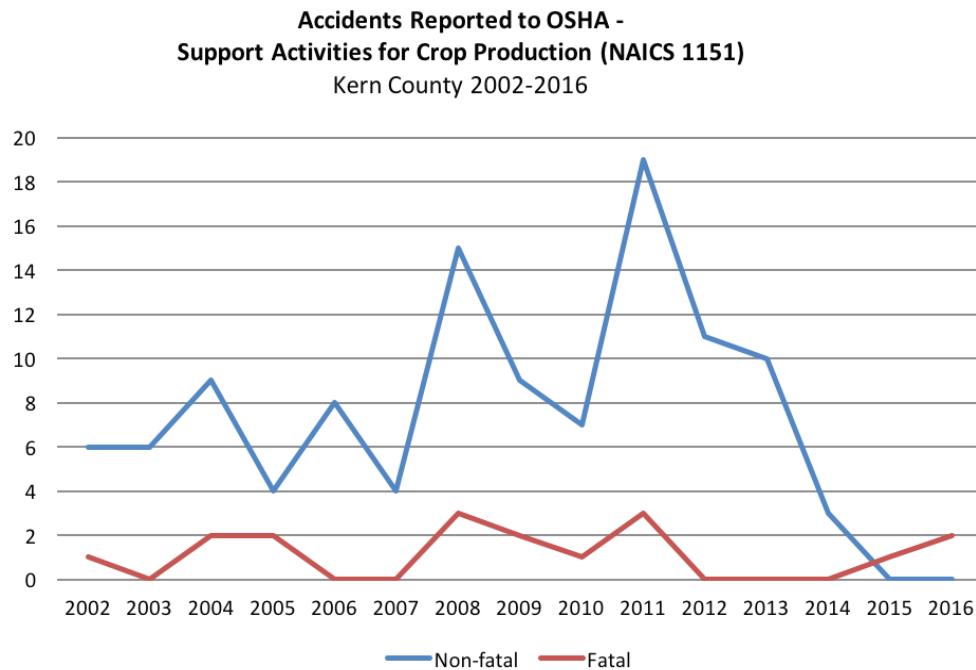
Figure 62 shows the total number of accidents reported to OSHA in Kern County from 2002 to 2016.¹⁵⁹ OSHA descriptions of each accident are found in Appendix J. As is typical of farm work, the majority were injuries related to the use of vehicles and heavy machinery, followed by injuries due to falls and heat exposure. The majority of injuries were non-fatal. The number of non-fatal accidents reported each year has decreased from a high of 19 in 2011 to zero for the past two years (2015 and 2016). The number of fatal accidents ranges from 0 to 3 per year and does not appear to be increasing or decreasing over time.

¹⁵⁷ Bureau of Labor Statistics. (2016). Injuries, Illnesses, and Fatalities – Nonfatal occupational injuries and illnesses by industry. Retrieved March 29, 2017, from <https://www.bls.gov/iif/oshsum1.htm>

¹⁵⁸ Leigh, J. P., Du, J., & McCurdy, S. A. (2014). An estimate of the US government's undercount of nonfatal occupational injuries and illnesses in agriculture. *Annals of epidemiology*, 24(4), 254-259.

¹⁵⁹ This data is available by industry code and either state or zip code. Each zip code in Kern County had to be queried individually and then combined for county-level results.

Figure 62: U.S. Department of Labor's Occupational Safety and Health Administration (OSHA) accidents for support activities for crop production (NAICS 1151) in Kern County (2000–2013)
 Source: U.S. Bureau of Labor Statistics, OSHA Enforcement Data



The California rate of non-fatal injury and illness for farm workers¹⁶⁰ was 5.4 per 100,000 workers in 2015,¹⁶¹ slightly below the national rate of 5.6.¹⁶² The California rate of fatal injury and illness in 2015 was 17.1 per 100,000 workers in “agriculture, forestry, fishing, and hunting” (NAICS 11, which includes NAICS 1151), again below the national rate of 22.8.¹⁶³

Comparable rates for Kern County cannot be calculated for a number of reasons,¹⁶⁴ the primary of which is a lack of sufficiently accurate data on the number of farmworkers at the county level. The data collection methods used by the Bureau of Labor Statistics Quarterly Census of Employment and Wages (QCEW) likely undercount farmworkers,¹⁶⁵ and farm labor contractors, which employ many of Kern County’s farmworkers, may be registered in one county but supply workers to others.¹⁶⁶ Thus, a worker count accurate enough at the county level to determine valid county level injury rates is not publically available at this time.

160 NAICS 1151, Support Activities for Crop Production

161 U.S. Bureau of Labor Statistics. (2015). California Nonfatal occupational injuries and illnesses data by industry (S01), NAICS 1151.

162 Bureau of Labor Statistics. (2015). National Injury and Illness Data. Table 1: Incidents rates of non-fatal occupational injuries and illnesses by industry and case types, 2015. Retrieved May 1, 2017 from <https://www.bls.gov/iif/oshwc/osh/os/ostb4732.pdf>

163 Bureau of Labor Statistics. (2015). Fatal Occupational Injuries in Charts, 2015. Number and rate of fatal work injuries by industry sector, 2015. Retrieved May 16, 2017 from <https://www.bls.gov/iif/oshwc/cfoi/cfch0014.pdf>

164 In addition to the primary reason detailed in the main text, others include (a) OSHA data is for injuries only, while BLS national/state data includes injuries and illnesses, (b) BLS national/state data is based on a surveyed subsample of all establishments, (c) fatal injuries are not reported at the same level of industry detail as non-fatal injuries, (d) the hours data used at the state/federal level to calculate hours-based rates is not available at the county level.

165 Martin, P. & Costa, D. (2017). Farmworker wages in California: Large gap between full-time equivalent and actual earnings. Economic Policy Institute, Working Economics Blog. Posted March 21, 2017. Retrieved May 10, 2017 from <http://www.epi.org/blog/farmworker-wages-in-california-large-gap-between-full-time-equivalent-and-actual-earnings/>

166 Personal communication with Don Villarejo, May 15, 2017.

MEASURE 2: Agricultural pesticide related illnesses reported through the California Pesticide Illness Surveillance Program

Background

Agricultural workers experience the vast majority of agriculture-related pesticide illnesses in California, with the exception of some drift incidents.¹⁶⁷ Pesticide related illnesses are reported by physicians through the California Pesticide Illness Surveillance Program. Those physician reports classified by the California Department of Pesticide Regulation as *definitely*, *probably*, or *possibly* related to pesticide exposure can be queried by the public using the California Pesticide Illness Query (CalPIQ). Like OSHA injury and illness data, the vast majority of reported pesticide illnesses are acute rather than chronic. Only farmworkers who seek and receive professional medical care in California will show up in CalPIQ. Undocumented workers are less likely to have health insurance and to seek health services than other workers,¹⁶⁸ and so may be underrepresented in this data.

Figure 63 shows the number of agriculture related pesticide illness in Kern County from 2000–2014. The number of reported illnesses has decreased from the early 2000s, and was at its lowest recorded level (three illnesses) in 2014.

Figure 63: Agriculture related pesticide illnesses in Kern County (2000–2014)

Source: California Pesticide Illness Query (CalPIQ)

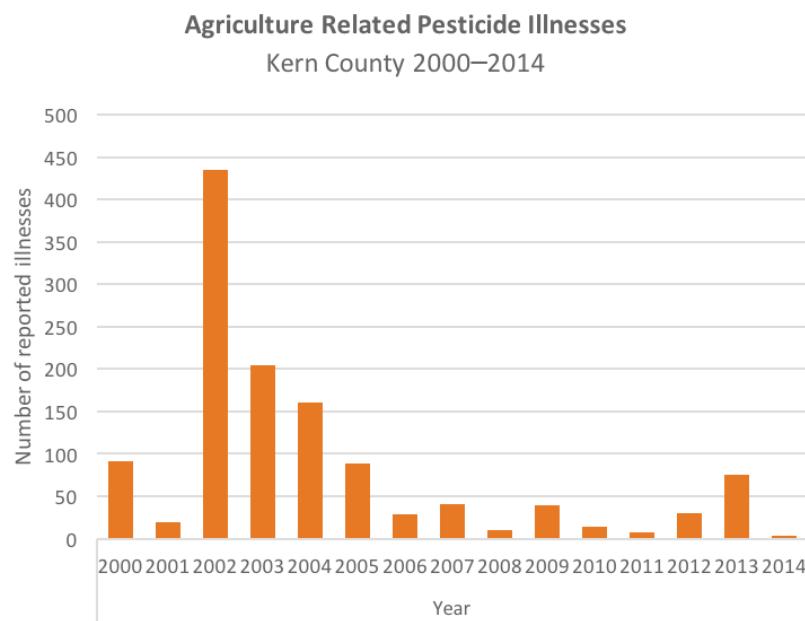


Figure 64 shows the method of exposure for agriculture related pesticide illnesses in Kern County from 2000–2014, and in 2013.¹⁶⁹ Drift was the method of exposure for 79 percent of illnesses over the last 15 years, followed by residue (19 percent). This is reversed in years with few or no drift incidents. Residue was the most common method of exposure in 2013 and 2014.

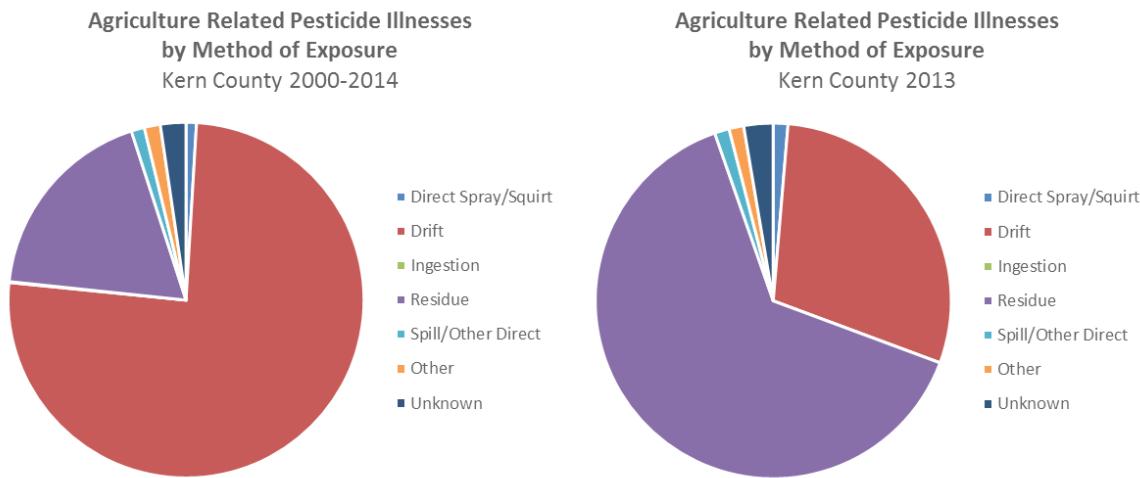
¹⁶⁷ Data presented here include all agriculture-related pesticide illnesses, the majority of which involve field workers.

¹⁶⁸ Schenker, M. (2017). The health of immigrant farmworkers. Campus Community Book Project Public Lecture, University of California Davis.

¹⁶⁹ The year 2013 was chosen to visualize instead of 2014 because there were only three illnesses reported in 2014.

Figure 64: Agriculture related pesticide illnesses in Kern County by method of exposure (2000–2014)

Source: California Pesticide Illness Query (CalPIQ)



INDICATOR 3.4.2 Labor law violations among farm labor contractors

Background

The U.S. Department of Labor's Wage and Hour Division (WHD) is responsible for monitoring and enforcing compliance with the U.S. labor law, in particular the Fair Labor Standards Act (FLSA), which deals with minimum wage, overtime, and youth employment.¹⁷⁰ The WHD has collected more than \$1.2 billion in back wages on behalf of workers nationally over the last five years,¹⁷¹ including \$27 million for agricultural workers.¹⁷²

The WHD also enforces the Migrant and Seasonal Agricultural Worker Protection Act (MSPA), which protects migrant and seasonal agricultural workers by establishing employment standards related to wages, housing, transportation, disclosures and recordkeeping, and requires farm labor contractors to register with the U.S. Department of Labor.¹⁷³

Kern County Trends

In Kern County, four of the 10 job categories with the highest number of WHD cases between 2003–2014 were in the food system, including farm labor contractors, full service restaurants, limited service restaurants, and grocery stores. Of these, 72 percent of the WHD cases were farm labor contractors, 27 percent were restaurants, and one percent were grocery stores. Each case may have any number of violations associated with it. More than 99 percent of all WHD violations in Kern County's food system were farm labor contractors. For this reason, only trends in farm labor contractors are shown here.¹⁷⁴

The majority (89 percent) of violations among farm labor contractors were violations of the Migrant and Seasonal Agricultural Worker Protection Act (MSPA). The remainder (11 percent) were violations

¹⁷⁰ United States Department of Labor. (2009). Wage and hour division. General information on the Fair Labor Standards Act (FLSA). Retrieved March 29, 2017, from <https://www.dol.gov/whd/regs/compliance/mwposter.htm>

¹⁷¹ United States Department of Labor. (n.d.). Wage and hour division (WHD)—data. Retrieved March 29, 2017, from <https://www.dol.gov/whd/data/>

¹⁷² United States Department of Labor. (2016). Wage and hour division table: Agriculture – all acts. Retrieved March 29, 2017, from <https://www.dol.gov/whd/data/databases.htm#panel6>

¹⁷³ United States Department of Labor, Wage and Hour Division. (2008). Fact sheet #49: The Migrant and Seasonal Agricultural Worker Protection Act. Retrieved March 29, 2017, from <https://www.dol.gov/whd/regs/compliance/whdfs49.pdf>

¹⁷⁴ Department of Labor enforcement data queries for WHD cases were run using Standard Industrial Classification (SIC) industry codes, rather than North American Industrial Classification System (NAICS) codes.

of the Fair Labor Standards Act (FLSA).

Figure 65a shows the total number of WHD violations in Kern County from 2003 to 2014. There are usually multiple violations per each case. The violations shown in Figure 65a represent from one to 10 individual cases each year (Figure 65b). There is no statistically significant trend in the number of cases or violations over this time.

Figure 65a: U.S. Department of Labor Wage and Hour Division violations in Kern County—Farm Labor Contractors and Crew Leaders (2003–2014)¹⁷⁵

Source: U.S. Bureau of Labor Statistics, WHD Enforcement Data

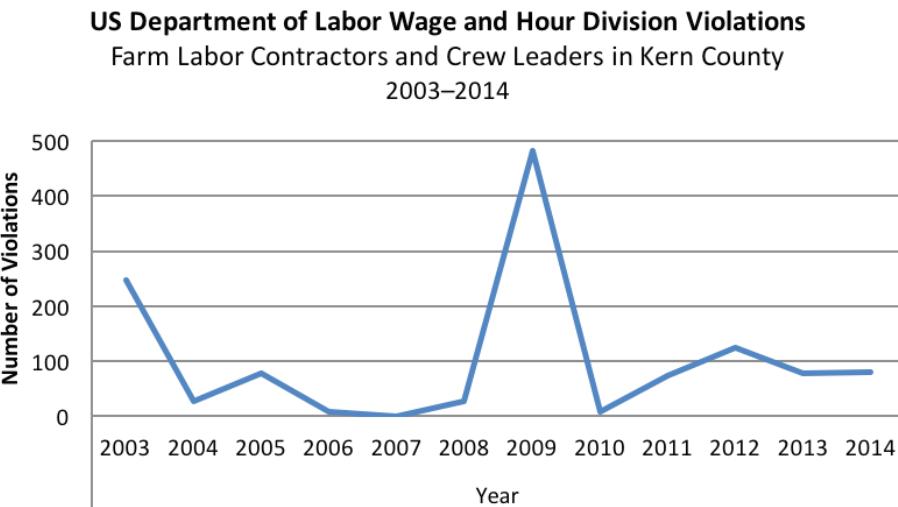
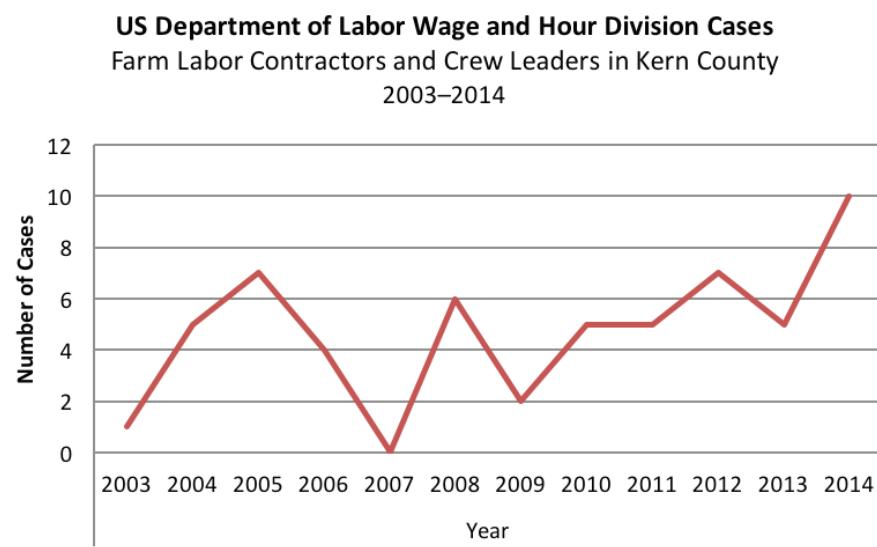


Figure 65b: U.S. Department of Labor Wage and Hour Division cases in Kern County—Farm Labor Contractors and Crew Leaders (2003–2014)

Source: U.S. Bureau of Labor Statistics, WHD Enforcement Data



¹⁷⁵ SIC 0761



Community garden in Arvin

PHOTO CREDIT: SHOSHA CAPPS

Observations and Opportunities

This assessment highlights trends in the health and well-being of Kern County's people, economy, agriculture, and environment. These trends are organized into three vision areas that were developed collaboratively by stakeholders:

- Vision 1: Healthy, empowered food consumers
- Vision 2: Healthy local food economy
- Vision 3: Healthy farms and environment

In this section, we summarize observations about these trends, highlight successes and challenges in relation to stakeholder goals, and suggest possible opportunities for future work.

The opportunities discussed here reflect both the data gathered for this assessment and a series of stakeholder discussions hosted by the Kern Food Policy Council between May 2015 and May 2017.

Vision 1: Healthy, empowered food consumers

Food consumers are impacted by the food system, and are also able to impact the food system through their choices and actions. When Kern County stakeholders came together for this project, they envisioned a food system in which healthy, empowered food consumers understand where their food comes from and are able to access affordable, healthy foods in their neighborhoods. In order to better understand the current relationships between Kern County residents and their food system, stakeholders selected goals around:

- Nutrition and agricultural education, especially involving children and youth
- Access to nutritious food, either via market channels or emergency food systems
- Reduction in edible food waste

Goal 1.1: Kern County students (K-12) have access to nutrition education and hands-on opportunities to learn about the food system

Successes

Schools provide a straightforward opportunity to reach children in Kern County with education about food, nutrition and agriculture.

Farm to School programs are an increasingly common way of providing this education. These programs may include a range of agricultural and food education activities, including school gardens, nutrition and agricultural education in classrooms, local farm tours, and regional sourcing of products for school meals.

The Kern County schools that participate in Farm to School programs source 30 percent of foods for school meals locally, creating opportunities for students to eat fresh, locally produced food and expanding markets for local farmers. As of the writing of this report, 34 schools in Kern County have school gardens, which are one of the most common ways for schools to engage children in experiential learning about food and agriculture. These schools are located within 17 districts (about one third of all districts). Over the past decade, between 5,000 and 10,000 students in Kern County have received nutrition education through the federally funded Expanded Food and Nutrition Education Program (EFNEP), which is administered by UC Cooperative Extension in Kern County.

Challenges

Although it is encouraging to see school gardens in one third of Kern County's school districts, individual schools with gardens only represent about 15 percent of all schools in the county, so most students in Kern County still do not have access to a school garden. Data on other Farm to School programming in Kern County is limited because so few districts participated in the USDA Farm to School Census. According to the census, 17 percent of Kern County school districts (32 percent of all schools) participate in Farm to School programs in some way. However, this number may not be reliable because so few school districts participated in the census. Only 3 percent of students in Kern County participate in EFNEP nutrition education.

Opportunities

- Increase the participation of Kern County schools in the USDA Farm to School Census. This will make it much easier to track progress in providing nutrition and agriculture education to schoolchildren.
- Support new garden development and/or look into opportunities for sharing gardens, as the Grimmway Academy currently does with the Buena Vista Elementary school (which does not have its own garden).
- The National Farm to School Network has resources to help districts introduce local food in cafeterias, classrooms, and through school gardens. Introduce or encourage the use of these resources in Kern County schools.
- Facilitate partnerships within or between schools, nonprofits, agricultural businesses, and UC Cooperative Extension to increase the number of school gardens in the county. Focus in particular on communities that do not currently have school gardens.
- Encourage districts not involved in Farm to School to visit those who are. Promote small ways to begin regional procurement, such as Harvest of the Month.
- Collaborate with the Kern County Farm Bureau and *Agriculture in the Classroom* to support agricultural education, perhaps as a part of Farm to School programming. Help link regional farmers with classrooms and arrange farm tours for students.

- Look for ways to expand linkages between EFNEP nutrition education, school gardens, and other Farm to School programming so that children participate in multiple venues simultaneously to increase regional food knowledge, attitudes and behaviors. This type of multifaceted intervention has been shown to be more effective in changing attitudes and behaviors about healthy eating.¹
- Work with UC Cooperative Extension in Kern County to be sure EFNEP is considered when planning for nutrition education in K-12 classrooms.²
- Collaborate with people in higher education (CSU Bakersfield, UC campuses, Bakersfield College) to increase nutrition education offered in K-12 and in colleges.

Goal 1.2: Kern County residents have access to affordable, healthful food at all times that reflects their cultural values

Successes

Approximately 30 percent of low income individuals (at or below 200 percent FPL) in Kern County reported experiencing food insecurity in 2014, the lowest level in the past decade. However, poverty levels remained relatively constant over the same period, suggesting this decrease may not represent a sustainable downward trend. Based on the available information, it seems most likely that the reported decrease in food insecurity reflects the success of the temporary food aid provided by the state to drought impacted counties (including Kern) in 2014. Though families are not generally considered to be food secure if they rely on emergency food aid, this aid may reduce some of the worst hardships associated with food insecurity, like hunger and skipped meals. This is an important success and points to the significance of robust food aid programs in the county.

Those in Kern County who are experiencing food insecurity can receive support for accessing basic food resources through government food programs as well as private emergency food programs. Emergency food distribution has increased over time among two of the three major emergency food distributors in the county—CAPK Food Bank and The Garden Project. Though this does not necessarily represent success in addressing the root causes of food insecurity, it does represent the expansion of an important safety net for families in Kern County.

Some farmers in Kern County donate fresh produce to food banks in the county, providing healthy, local produce to low income families and reducing potential food waste.

Challenges

Food insecurity and hunger are long-standing challenges in Kern County. Over the past decade, between 30 and 50 percent of Kern County residents with incomes less than or equal to the Federal Poverty Line (FPL) have experienced food insecurity. Residents with incomes at or below 200 percent of the FPL³ make up almost half of all Kern County residents.

Despite the fact that Kern County sells almost \$4 billion in agricultural commodities each year, rates of both food insecurity and poverty are consistently higher in the county than in California and the rest of the nation. Since 2011, Kern County's poverty rate has hovered around 25 percent, meaning one of four individuals falls at or below the FPL. Many people who live in poverty also lack access to a vehicle, and some neighborhoods in Kern County lack adequate food stores in walking distance or easily accessible by public transportation. Almost one third of residents who are eligible for government assistance via CalFresh do not take advantage of the program. Food donations, particularly

1 Scherr, R.E., Dharmar, M., Linnell, J., Dharmar, M., Beccarelli, L.M., Bergman, J.J., Briggs, M., Brian, K., Feenstra, G., Hillhouse, J.C., Keen, C.L., Ontai, L.L., Schaefer, S.E., Smith, M.H., Spezzano, T., Steinberg, F.M., Sutter, C., Young, H.M., & Zidenberg-Cherr, S. (2017). A multi-component, school-based intervention, the Shaping Healthy Choices Program, improves nutrition-related outcomes. *Journal of Nutrition Education and Behavior*.

2 As of the summer of 2017, the USDA required EFNEP personnel to do direct teaching vs. having teachers do it. There are currently efforts to return to using teachers as EFNEP extenders..

3 \$11,670 for an individual and \$23,850 for a 4-person household in 2014

fresh produce donations, are difficult to track at the county level, making progress in this area challenging to determine.

Opportunities

- Work with California EFNEP and Kern County SNAP/CalFresh leaders and administrators to identify opportunities for increasing the participation of eligible individuals in CalFresh. A recent UC study showed that programs such as these can have long lasting benefits for the children that participate in them, improving nutrition practices and potentially lowering future public health expenses.⁴
- Community Action Partnership of Kern (CAPK) has put together a GIS map of fresh produce availability and transportation access in the greater Bakersfield area that can help identify areas of high poverty (and likely high food insecurity) and low access to food stores. Use this map to prioritize efforts in those areas of Kern County that are most lacking in food access. Possible activities could include promoting new or existing sources of produce, including road side stands, farmers markets, pop-up markets (like Hen's Roost), and healthy food trucks, or encouraging corner stores to stock more fresh produce.
- Collaborate across sectors to identify ways to further reduce edible food waste and increase food recovery throughout the food system. Document activities and outcomes in a consistent way over time so total impact can be measured.
- Promote increased involvement of faith-based communities throughout the county in expanding access to recovered and/or fresh food.
- To strengthen linkages between the agricultural and food security sectors in Kern County, explore more and different opportunities for farmers to increase donations and reduce edible food waste, such as gleaning projects. Include urban farms and backyard and community gardens as potential sources for donations.

Vision 2: Healthy local food economy

Kern county stakeholders envisioned a healthy, local food economy as one with strong local food markets and good jobs. To understand progress toward this vision, stakeholders selected goals around:

1. Food production, distribution and sales, with a particular focus on local sales
2. Job opportunities in the Kern County food system

Goal 2.1: Kern County improves regional economic opportunities for local food producers

Successes

The food production capacity in Kern County is robust, with total agricultural sales increasing substantially since 2002 and registering nearly \$4 billion in 2012.⁵ The majority of the food produced in Kern County serves national and international markets, however local sales make up a small but growing segment of Kern County's agricultural economy. Direct-to-consumer sales, a subset of all local sales, totaled \$6 million in Kern County in 2012. The average amount of direct sales per farm in Kern County in 2012 was \$44,328, more than double the state average and four times the national average. Businesses like The Hen's Roost or EcoCentric Farm are examples of successful small food businesses in Kern County.

⁴ Page, M. (2017). The Intergenerational Transmission of Poverty and the Long Reach of Child Health and Nutrition Program. Bacon Public Lectureship and White Paper, University of California Davis.

⁵ USDA National Agricultural Statistics Service. (2014). USDA 2012 census of agriculture. Retrieved March 08, 2017, from agnensus.usda.gov.

Challenges

It is difficult to measure total local sales, since the majority of those sales are made through traditional distribution channels like grocery stores or restaurants and are not tracked by any government agency. The USDA does track direct-to-consumer sales, and while significant to the farms and consumers that participate, these sales only made up 0.15 percent of total agricultural sales in Kern County in 2012, compared to 0.40 percent in California. Farms with direct-to-consumer sales made up 7 percent of all farms in Kern County, versus 11 percent in California. This likely reflects Kern's large role in supplying external markets more than a weakness in its local markets. Nonetheless, there is clearly room for growth in this area.

Food entrepreneurs and specialty food manufacturers serving local markets exist throughout the state. However, it is difficult to document their presence in Kern County. Although there were about 100 cottage food permits issued in 2015, this may only represent a small fraction of all local food businesses.

There are currently only about a dozen⁶ farmers markets in the county; only five of which accept EBT. There are currently no food hubs in Kern County that could aggregate and distribute food produced locally by small and mid-sized farms.

Opportunities

- Work with farmers' market managers and/or community organizations to explore the market viability of opening new markets. Involving beginning farmers in these new markets could provide them with opportunities to improve their marketing skills.
- Assist those farmers markets that do not currently accept EBT to apply for EBT use.
- Support local farms directly by promoting them publically (highlight a "Kern County farm of the month," or pass along CSA subscription info), or by making it a priority to purchase locally for Kern Food Policy Council events.
- In addition to direct sales, some farms may also want to diversify their sales and markets by exploring retail (grocery stores), institutional sales and restaurants. If food hubs are viable, they may be able to help aggregate and distribute to larger buyers than is possible for individual small and mid-scale farms. Explore the possibility of working with the Fresno Food Commons (a food hub in Fresno) to increase institutional sales.
- Contact schools and institutional buyers such as at CSU Bakersfield (CSUB), Bakersfield College, and UCCE to encourage them to buy local foods (either directly from farms or through their regional distributors) for their cafeterias or catering needs. Work with statewide Farm to School personnel (such as the Community Alliance with Family Farmers—CAFF, or the California Department of Food and Agriculture's Office of Farm to Fork) to access resources for expanding these markets.



PHOTO CREDIT: GREG/GOR

Kern County farmers market.

⁶ This number varies depending on the source. It could be as high as 15 markets.

- Connect with local financial institutions, businesses, chambers, economic development organizations, local permitting authorities and community organizations to explore policies for encouraging the creation of new small food businesses and/or exploring policies to strengthen these businesses. Work with community organizations, higher education and UCCE to explore alternative financing and access to capital for beginning food/agricultural businesses.
- Compile a resource guide with contacts from local governmental agencies, CSUB, community colleges, UCCE and others for small, beginning food and agricultural businesses.
- Partner with academic institutions (such as CSU Bakersfield, Bakersfield College) and/or UC Cooperative Extension to explore grants and other funding opportunities to provide technical assistance to farms and food businesses serving local markets.

Goal 2.2: All Kern County residents have access to local food

PHOTO CREDIT: JILL EGGLEND



Kern County farmers market display.

Successes

Local food can be found in Kern County at grocery stores, restaurants, farmers markets, schools, community gardens, and food banks. Several of these sources, including community gardens, farmers markets, schools, and food banks, are working to create opportunities for more affordable access to local food.

As of 2016, there are 16 community gardens in Kern County. Local farms donated between 15,000 and 28,000 pounds of fresh produce each of the last four years, and this is likely to be an underestimate. Between 2013 and 2016, the percentage of farmers markets in Kern County that accepted EBT increased from 19 percent to 42 percent.

Challenges

Reliable data on local food sales is difficult to obtain, though we do know that local sales make up only a small percentage of all sales in Kern County. Physical access to sources of local food—whether grocery stores, markets or gardens—may be a critical barrier for some individuals, especially those in lower income communities who may be less likely to have access to a personal vehicle. Although bus routes crisscross the county, particularly in Bakersfield, areas with limited service create challenges for those without a vehicle to reach existing food outlets.

Opportunities

- Work with community organizations, schools, CSUB and UC Cooperative Extension, especially in rural areas and lower-income communities, to organize more community and backyard gardens. Document efforts and evaluate the impacts.
- Work with UCCE to bring a Master Gardener program to Kern County.
- CAPK's GIS map is a comprehensive picture of transportation routes overlaid on food outlets and income level. Use this tool as a first step in analyzing areas that need attention. Collaborate with local planners to identify priority areas and evaluate the feasibility of different ways to improve physical access to local foods.

Goal 2.3: The Kern County food system provides job opportunities

Successes

The food system provides jobs for thousands of Kern County workers, from farmworkers to those employed in input supply, distribution, processing, transportation, and food service. Kern County hosts a much higher percentage of food systems jobs than California or the U.S., with one in three workers employed in the food system (versus one in seven statewide and nationally). In four of the top food systems job categories (by number of employees) in Kern County, average wages are higher than the same jobs in California or the U.S. These include fruit and nut tree farming, vegetable and melon farming, cattle ranching, and greenhouse/nursery. In 2014, the weighted average for the top ten highest paid food system job categories in Kern County was \$41,792.

Challenges

Though there are a handful of food systems jobs in Kern County with higher wages than state or national averages, most of the food systems jobs in Kern County fall into low wage categories. The most numerous food systems jobs are food service and crop production jobs. In six of the top food system job categories (by number of employees), wages were lower in Kern County than the same jobs in California or the U.S. Food service and crop production, the two job categories with the most workers in Kern County, both fall in this category. The weighted average for the lowest paid food system jobs in Kern County in 2014 was \$19,891, which is below the Federal Poverty Line (FPL) for a family of 4 (\$23,850). The food system job category with the most employees, accounting for almost half (44 percent) of the employees in Kern County's food system, is "support activities for crop production" which includes farm labor and management. For this category, the average wage was \$21,313, also below the FPL. The category with the second most employees, "restaurants and other eating places," had an even lower average wage (\$15,256). This average wage also falls below the FPL.

These data suggest that the majority of workers in the food system might be classified as "working poor" and find it very difficult to make ends meet.

Opportunities

- Work with innovative local farmers, farm support organizations such as the Farm Bureau, and community organizations that work with farmworkers to identify strategies for enhancing farmworker working conditions (year-round labor, health benefits, fair wages, safe housing, etc.). Share success stories from farms who are currently engaged in these strategies. The Food Chain Workers Alliance suggests specific strategies for policymakers, for consumers and for employers to improve working conditions for farm labor and others in the food system.⁷
- Work with the community organizations and others (Restaurant Opportunities Center United, Food Chain Workers Alliance) to support improved wages for restaurant employees.

Vision 3: Healthy farms and environment

For Vision 3, "healthy farms and environment," Kern County stakeholders envisioned an agricultural sector that is productive, profitable, diverse, and is also a good steward of natural and human resources. To understand progress toward this vision, Kern County stakeholders selected goals around:

- Diversity in farms and producers
- Safe pest control

⁷ Food Chain Workers Alliance. 2012. *The Hands that Feed Us. Challenges and opportunities for workers along the food chain.* Food Chain Workers Alliance. www.foodchainworkers.org.

- Water quality
- Farmworker health and safety

The goals in this section involve complex issues, including several that impact communities that are currently underrepresented on the Kern Food Policy Council (farmers, farm support organizations, farm workers). Some of these issues may be difficult to fully understand without a specialized background, and at times there may not be agreement, even among experts, about appropriate strategies for change.

Our primary recommendations related to the goals in this section are:

- Proactively build relationships with individuals, organizations, and agencies with expertise on agricultural issues prior to initiating activities to address challenges in these areas. Potential collaborators may include UC Cooperative Extension, local or state regulatory agencies, farm support organizations, commodity boards, or public health or workers' rights advocates.
- If an issue has the potential to be politically polarizing, open communication channels with representatives of opposing perspectives before deciding on the best course of action. There may be more common ground than expected or it is possible that common goals can be established. If common ground cannot be found, your position will be stronger for having listened carefully to the concerns of all sides. Keep in mind that even when goals are shared, strategies for change may differ. Commit to learning from those most directly involved with the issue at hand, particularly those you disagree with.

Goal 3.1: Kern County agriculture is diverse

Successes

In terms of the number of type of crops grown, agriculture in Kern County is both highly productive and highly diverse. Farmers in Kern County are also more demographically diverse than farmers in the rest of the country. Approximately 18 percent of farms in Kern County are operated by farmers of color, compared to 6 percent nationally. Women-run farms also make up 18 percent of the farms in Kern County, compared to 13 percent nationally. Kern County supports farms of all sizes and led the state in organic farm sales in the early 2000s.

Challenges

Like the rest of California and the U.S. as a whole, the farming population of Kern County is aging, and smaller farms and farms run by beginning farmers, women farmers, and farmers of color are in the minority and may face unique challenges. A higher percentage of farms in Kern County are large compared to state and national averages, and though this does not necessarily mean that smaller farms are struggling, it is worth paying attention to any changes in farm size distribution to ensure that farms of all sizes continue to succeed.

Though farmers in Kern County are more demographically diverse than the rest of the country, they are still considerably less diverse than the general population in Kern County, both in terms of race and gender.

Organic sales have fallen in Kern County since the early 2000s, even as this sector has grown at the state level.

Opportunities

- Support new or existing programs that assist farmers in Kern County who find themselves in the minority, including smaller scale, beginning, organic, limited resource, and/or socially disadvantaged farmers, including farmers of color, young farmers, beginning farmers, women farmers, non-English speaking farmers, farmers not born in the United States, and farmers with

disabilities. Support could include increased opportunities for training and technical assistance (production or marketing), business planning, financial assistance, mentorship, or encouraging the hiring of more diverse staff at local farm support organizations and agencies. Publish any educational and outreach materials in multiple languages. Offer translation services and other accessibility accommodations at events to ensure diverse participation.

- Kern County boasts a very culturally diverse consumer population. Support market feasibility studies for agricultural and food products that are part of these food traditions but are not currently produced locally.
- Potential collaborators in pursuing the opportunities above and generating new opportunities could include the Kern County Farm Bureau, Kern County UC Cooperative Extension (including 4-H), CSUB, Bakersfield College, Farm Credit, Future Farmers of America (FFA) and nonprofit farm support and advocacy organizations. These potential collaborators may have existing programming in this area, so make sure to involve them from the very beginning in any efforts to incorporate lessons they may have learned and avoid duplication.

Goal 3.2: Kern County reduces risks associated with pesticide use

Successes

Over the past decade, the use of lower risk pesticides, including microbial and pheromone products, has increased in Kern County while the use of the majority of higher risk pesticides has decreased. Compliance with pesticide use regulations has increased over the same time period, likely due to joint efforts by the Kern County Agricultural Commissioner's Office, Kern County UC Cooperative Extension, and Kern County Farm Bureau. The number of individuals impacted by pesticide drift incidents has decreased, and the use of restricted materials near schools appears to be decreasing as well.



PHOTO CREDIT: GREG GIGOR

Agricultural worker harvesting carrots

Challenges

The use of higher risk fumigants has increased slightly over the past decade in Kern County. Although fumigants make up a very small percentage of total pesticide applications (less than 1 percent), they represent approximately a quarter to a third of total pounds of pesticides applied.

Although California (and Kern County) keeps excellent records of pesticide use, it is difficult to assess the relationship between pesticide use and risk of harm to humans or the environment due to data limitations and the complexity of the issue. Pesticide use alone cannot describe pesticide risk, exposure, or harm, each of which is much harder to assess and track. Broad categorizations of pesticides are also of limited use, as each pesticide has a unique profile and pattern of use. Lower risk pesticides are not risk free, and the application of higher risk pesticides does not imply harm was done.

Data on exposure and harm relies primarily on reports made by doctors on behalf of patients. More vulnerable populations, such as undocumented farm workers or individuals without health insurance, may be less likely to seek care and have their exposure or health impacts reported. Health impacts related to chronic pesticide exposure (as opposed to acute poisoning) are also likely to be underreported as they are less likely to be recognized or directly attributable to exposure.

Opportunities

- Promote existing programs within the farming community that share the KFPC's objective of reducing the risks associated with pesticide use and promoting best practices. Examples include the Spray Safe Program, the California Almond Sustainability Program, and local Integrated Pest Management (IPM) programs.
- Build relationships with individuals and organizations that are already working on this issue from various perspectives. Examples include UC Cooperative Extension, the Agricultural Commissioner, Farm Bureau, commodity boards, and public health and advocacy groups that work on pesticide issues.
- Work with partners with pesticide expertise to discuss how to reduce the risks associated with fumigant use and promote best practices.
- Work with partners to identify and respond to residents' questions and concerns about pesticide use and health. Potential partners might include UCCE, CSU Bakersfield, health providers, planners, nonprofit or advocacy organizations, Farm Bureau and the Agricultural Commissioner's office.

Goal 3.3: Kern County's water resources are conserved and promote ecosystem health

Ensuring that water resources are used beneficially and efficiently and that water quality is protected are important issues across California. In Kern County, we chose to look specifically at two pieces of California's complex water system that were of particular interest to stakeholders in Kern County—agriculture water use and nitrate contamination of water resources (groundwater, surface water, and drinking water).

Successes

The vast majority of Kern County residents (more than 99 percent) who get their water from public water systems receive water with nitrate levels well below the maximum contaminant level (MCL) of 45mg/L. Surface waters in Kern County have never tested above the MCL since testing began in the 1970s, and average groundwater levels have also remained below this level over the past 25 years, though individual samples have exceeded it in six years during that period.

Kern County's agriculture is highly efficient in its use of water. Even as yields have increased and the most common crops harvested have changed, total irrigated acres and total estimated water use have remained stable.

Challenges

The number of MCL violations for nitrate in Kern County public drinking water systems has increased over the past four years from an average of two violations per year from 2000–2010, to an average of 55 violations per year from 2011–2014. Though these violations impact a very small number of people in Kern County (less than 1 percent of the population), their rise is worth paying attention to.

Although about 96 percent of people in California get their drinking water from public sources, the remainder rely on private domestic wells. Studies have shown that these wells are more than twice as likely as public water systems to exceed drinking water standards for nitrate; however they are not regularly monitored for water quality.

Although Kern County agriculture is highly efficient in its use of water resources, challenges associated with irrigated agriculture remain. These include groundwater overdraft, accumulation of salts, and water contamination (including but not limited to nitrate).

Opportunities

- Nitrate contamination of groundwater is a challenge across the world and there are no easy solutions. The greatest opportunities to impact this issue likely lie in building relationships with those who are already working on this issue, including regulatory agencies, farm support organizations, and advocacy groups.
- Conduct education around nitrate contamination to help consumers appropriately assess and mitigate their risk. Topics could include how to access public water reports, how to get a domestic well tested, or what types of water filtration systems are effective in lowering nitrate levels.
- Support and promote existing efforts to increase water and nitrogen use efficiency.

Goal 3.4: Kern County's food systems workers are part of a safe and fair work environment

Successes

Kern County's food system provides a large percentage of the county's jobs—approximately one in three, versus one in seven in the rest of the state and country.

The number of reported pesticide drift incidents and pesticide related illnesses—the majority of which impact farmworkers – has decreased in Kern County over the past 15 years. The number of non-fatal occupational injuries involving farmworkers in Kern County has decreased steadily from a high of 19 in 2011 to zero in both 2015 and 2016.

Challenges

Wages in the food system are low and food systems workers are twice as likely to be food insecure as other workers. For some job categories, including those with the most workers, wages in Kern County are below state and national averages.

In addition to low wages, food systems workers face unique occupational hazards, particularly those involved in crop production and food manufacturing. Approximately 90 percent of farmworkers in California are foreign born and 56 percent are undocumented, making them particularly vulnerable to occupational hazards and wage theft.

In Kern County, there have been approximately 100 violations of the Migrant and Seasonal Agricultural Workers Protection Act (MSPA), recorded annually by the US Department of Labor, over the past three years. Over the past ten years, MSPA violations have ranged from zero to 500 per year.

Opportunities

- Increase farmworker and other food systems worker representation on the KFPC. These workers and their direct representatives are best positioned to guide discussions about how the council could address the challenges they face. Offer translation services at KFPC meetings.
- Build relationships with workers, farm labor contractors, farmers, and farm support organizations. Each will likely have a different perspective on the challenges and potential solutions to labor equity and safety issues.
- Support and promote existing programs that share the KFPC's objectives around farmworker safety, like Spray Safe.

Data Gaps

Throughout this assessment, we found areas in which data either were not publically available, not available at all, or available in databases too large and complex for the lay person with a personal computer to access. In other cases, there were significant discrepancies between federal, state and local data which were beyond the scope of this report to address. A few examples are included here, along with questions and recommendations where appropriate.

Vision 1: Healthy, empowered food consumers

- Most school districts in Kern County do not fill out the biennial Farm to School Census survey. This survey collects data on local procurement, dollars spent in the local economy, school gardens and nutrition and food education. It is a relatively easy way to document progress in these areas on a countywide basis. All school districts should be encouraged and helped (if necessary) to fill out this survey.
- It would be helpful to agree upon and commit to a consistent set of metrics to document food recovery and distribution in Kern County, at least among the three organizations that account for the majority of emergency food distribution—CAPK, The Garden Project and Golden Empire Gleaners. If possible, include the amount of fresh produce (pounds) as one of those metrics and decide on consistent ways to gather this data. It may work well for one organization to be the repository for the annual summaries.

Vision 2: Healthy local food economy

- There are large discrepancies between the USDA-NASS Census of Agriculture (which we used for most of this assessment across many indicators) and the Kern County crop reports, prepared by the county Agricultural Commissioner's office. Total agricultural sales is perhaps the most glaring difference (\$4 billion according to the USDA in 2012; \$6.2 billion according to the Kern County Crop Report, 2012). Although we talked with representatives from both data sources, neither could explain the differences beyond describing how they gathered their own data. It was beyond the scope of this report to spend more time analyzing the discrepancy. This could be investigated more thoroughly in the future.
- There was very little available data on small and mid-scale food entrepreneurs. If this is of interest to the county, metrics for measuring progress should be identified and data gathered on a regular basis.
- We found four lists of farmers markets in the county and each listed different markets and numbers. It would be helpful if all the organizations that deal with farmers markets (including counting them and recording their locations) could come together to decide on a common protocol and publish one central, publically available list. This list could also include whether or not the market accepts EBT.
- If community gardens are of interest, it may be most efficient to designate one organization to be responsible for keeping a central, publically available list with input from all other involved parties.

Vision 3: Healthy farms and environment

- The primary challenge in this section was the complexity of the issues addressed and the corresponding data, most of which was collected by government regulatory agencies. Cause and effect were not always easy to determine, and each indicator had important limitations that had to be acknowledged.

- Because most of the data included in this section were collected by regulatory agencies tracking a particular issue of concern to the public, there was a somewhat negative framing inherent in the available data. For example, it is much easier to track nitrate contamination than grower efforts to improve nitrate use efficiency because there are government agencies that do the expensive and time consuming work of collecting nitrate contamination data and making it available to the public. There is no equivalent tracking mechanism for the efforts of local growers.
- Department of Labor enforcement data is available only by state or by zip code. In order to look at Kern at the county level, each zip code in the county had to be queried individually and then summarized. This was time consuming and may be a barrier to tracking trends in these areas in the future. It is also not currently possible to compare county-level occupational injury rates to national or state rates due to the unavailability of sufficiently accurate worker counts at the county level and different methods of data collection and processing at different scales.
- Water use and quality data are spread across multiple agencies, and require some level of knowledge to query correctly. For example, running an accurate query requires discerning between types of water monitoring stations, and processing data correctly requires doing calculations to translate values recorded in different ways so that they are comparable.
- Pesticide Use Report (PUR) data are housed in large data sets that a standard home computer will struggle to download and work with (if looking at multiple pesticides over multiple years). We used <http://ziram.lawr.ucdavis.edu/PURwebGIS.html>, a tool that pre-processed some of this data and made it feasible for us to work with it within the scope of this project.

Forging Alliances

All Kern County stakeholders are united in wanting a county with a healthy population, a healthy agricultural economy, and a healthy environment. Bringing these stakeholder groups together to solve problems and innovate solutions will require overcoming the different languages and terminologies these groups use, and understanding that these groups may have different priorities at different times.

The Kern County Food Policy Council has made significant efforts to create a broad base of stakeholders. But gaps still remain that we recommend KFPC address in order to enhance its impact. Broadly, we recommend that Kern County FPC: (1) work to increase participation from the agricultural industry, and (2) provide more opportunities to alleviate misunderstandings between those who focus on social services that target low-income consumers and those who focus on the agricultural industry. We recommend taking every opportunity to attend each other's meetings and partner on projects that have complementary goals.

Opportunities

- Make an extra effort to bring stakeholders from the agricultural industry to the table at Kern County FPC meetings. Ask various people from the agricultural industry to make presentations. Structure times to do “field trips” or visit various stakeholders’ offices or sites.
- Explore possible projects (start small) in which groups from different parts of the food system can work together. These opportunities build trust over time, even if their direct outcomes are small.



PHOTO CREDIT: SHOSHA CAPPS

Appendix A:

Kern County Schools with Gardens

Vision 1: Healthy, Empowered Food Consumers

- **Goal 1:** Kern County students (K-12) have access to nutrition education and hands-on opportunities to learn about the food system
 - **Indicator 1:** Access to school gardens in Kern County
 - **Measure 1:** Number of school gardens in Kern County
 - **Measure 2:** Percentage of students attending schools with school gardens.

Schools that have a garden	Number of Students Enrolled (2014-15)	City	District
Bear Mountain Elementary (ASP)	720	Arvin	Arvin Union School District
El Camino Real Elementary (ASP)	871	Arvin	Arvin Union School District
Sierra Vista Elementary (ASP)	778	Arvin	Arvin Union School District
Cesar Chavez Elementary (Magnet Program)	642	Bakersfield	Bakersfield City School District
College Heights Elementary	884	Bakersfield	Bakersfield City School District
Henry Eissler Elementary (ASP)	625	Bakersfield	Bakersfield City School District
Franklin Elementary	479	Bakersfield	Bakersfield City School District
Fremont Elementary	893	Bakersfield	Bakersfield City School District
Thorner Elementary	874	Bakersfield	Bakersfield City School District
Voorhies Elementary	967	Bakersfield	Bakersfield City School District
William Penn Elementary (ASP)	286	Bakersfield	Bakersfield City School District
Buttonwillow Union School	343	Buttonwillow	Buttonwillow Union School District
Elk Hills Elementary	203	Tupman	Elk Hills School District
Fairfax Jr High (ASP)	504	Bakersfield	Fairfax Elementary School District
Virginia Elementary (ASP)	675	Bakersfield	Fairfax Elementary School District
Fruitvale Jr. High	711	Bakersfield	Fruitvale School District
North High School FFA Program	1585	Bakersfield	Kern High School District
Wallace Middle	331	Lake Isabella	Kernville Union School District
Lamont Elementary Special Ed	642	Lamont	Lamont Elementary
Lost Hills Elementary	422	Lost Hills	Lost Hills Union School District
Castle Elementary	704	Bakersfield	Panama Buena Vista Union School District
Reagan Elementary	942	Bakersfield	Panama Buena Vista Union School District
Thompson Jr High	741	Bakersfield	Panama Buena Vista Union School District
Van Horn Elementary (ASP)	575	Bakersfield	Panama Buena Vista Union School District
Rosedale Middle School	651	Bakersfield	Rosedale Union School District
Rare Earth Continuation High School	52	Rosamond	Southern Kern Unified School District
Conley Elementary ASP/Teachers garden	272	Taft	Taft City School District

Schools that have a garden	Number of Students Enrolled (2014-15)	City	District
Sunset Child Development Center	350	Bakersfield	Vineland School District
Vineland Elementary	473	Bakersfield	Vineland School District
Teresa Burke Elementary	803	Wasco	Wasco Union Elementary School District
Beardsley Jr High (Special Ed)	325	Bakersfield	Beardsley School District
Grimmway Academy (Charter)	513	Arvin	Partnership with Panama Buena Vista Union
Valley Oaks (Charter)	680	Bakersfield	Kern County Superintendent of Schools
Wonderful College Prep Academy (Charter)	875	Delano	Kern County Office of Education

Total Students Enrolled in Schools that have Garden	21,391
Total Students Enrolled in Kern County Schools (2014-15)*	182,372
Percentage of Students attending school with garden (2014-15)	12%

* 180,304 (from CA Dept of Ed) + 513 (Grimmway) + 680 (Valley Oaks) + 875 (Wonderful)

Source: Karen Bayne at UCCE Kern County; CA Dept of Education, Educational Demographics Unit

Appendix B:

Food Systems Job Categories

Vision 2: Healthy Local Food Economy

- Goal 3: Kern County's food system provides job opportunities
 - Indicator 1: Average wages in the Kern County food system
 - Indicator 2: Number of jobs in the Kern County food system

The North American Industry Classification System (NAICS) is the standard used by Federal agencies to classify business establishments for the purpose of collecting, analyzing, and publishing statistical data related to the U.S. business economy.

NAICS	1111	Oilseed and grain farming	NAICS	3115	Dairy product manufacturing
NAICS	1112	Vegetable and melon farming	NAICS	3116	Animal slaughtering and processing
NAICS	1113	Fruit and tree nut farming	NAICS	3117	Seafood preparation and packaging
NAICS	1114	Greenhouse and nursery production	NAICS	3118	Bakeries and tortilla manufacturing
NAICS	1119	Other crop farming	NAICS	3119	Other food manufacturing
NAICS	1121	Cattle ranching and farming	NAICS	3121	Beverage manufacturing
NAICS	1122	Hog and pig farming	NAICS	4244	Grocery and related product wholesalers
NAICS	1123	Poultry and egg production	NAICS	4245	Farm product raw material merchant wholesalers
NAICS	1124	Sheep and goat farming	NAICS	4248	Alcoholic beverage merchant wholesalers
NAICS	1125	Aquaculture	NAICS	4451	Grocery stores
NAICS	1129	Other animal production	NAICS	4452	Specialty food stores
NAICS	1151	Support activities for crop production	NAICS	4453	Beer, wine, and liquor stores
NAICS	1152	Support activities for animal production	NAICS	7223	Special food services
NAICS	3111	Animal food manufacturing	NAICS	7224	Drinking places, alcoholic beverages
NAICS	3112	Grain and oilseed milling	NAICS	7225	Restaurants and other eating places
NAICS	3113	Sugar and confectionery product manufacturing			
NAICS	3114	Fruit and Vegetable preserving and specialty			

Appendix C:

Microbial Pesticides

Vision 3: Healthy Farms and Environment

- Goal 3: Kern County reduces risks associated with pesticide use
 - Indicator 1: Adoption of integrated pest management (IPM) practices
 - Measure 1: Use of microbial pesticides

The following list of microbial pesticides was retrieved using the "active ingredient class" query tool in PURWebGIS (<http://ziram.lawr.ucdavis.edu/PURwebGIS.html>). The exact products used will vary by year and county. This is a list of all microbial pesticide products used in the state of California in 2014. Not all have necessarily been used in Kern County.

Agrobacterium Radiobacter	Bacillus Thuringiensis, Subsp. Kurstaki, Strain Hd-1
Agrobacterium Radiobacter, Strain K1026	Bacillus Thuringiensis Subspecies Kurstaki, Genetically Engineered Strain Eg7841 Lepidopteran Active Toxin
Aspergillus Flavus Strain Af36	Beauveria Bassiana Strain Gha
Bacillus Pumilus, Strain Qst 2808	Codling Moth Granulosis Virus
Bacillus Sphaericus, Serotype H-5a5b, Strain 2362	Coniothyrium Minitans Strain Con/M/91-08
Bacillus Subtilis Gb03	Gliocladium Virens Gl-21 (Spores)
Bacillus Subtilis Mbi600	Metarhizium Anisopliae Strain F52
Bacillus Thuringiensis (Berliner)	Myrothecium Verrucaria, Dried Fermentation Solids & Solubles, Strain Aarc-0255
Bacillus Thuringiensis (Berliner), Subsp. Aizawai, Gc-91 Protein	Nosema Locustae Spores
Bacillus Thuringiensis (Berliner), Subsp. Aizawai, Serotype H-7	Paecilomyces Fumosoroseus Apopka Strain 97
Bacillus Thuringiensis (Berliner), Subsp. Israelensis, Serotype H-14	Polyhedral Occlusion Bodies (Ob'S) Of the Nuclear Polyhedrosis Virus of Helicoverpa Zea (Corn Earworm)
Bacillus Thuringiensis (Berliner), Subsp. Kurstaki, Serotype 3a, 3b	Pseudomonas Fluorescens, Strain A506
Bacillus Thuringiensis (Berliner), Subsp. Kurstaki, Strain Eg 2348	Qst 713 Strain of Dried Bacillus Subtilis
Bacillus Thuringiensis (Berliner), Subsp. Kurstaki, Strain Sa-11	Reynoutria Sachalinensis
Bacillus Thuringiensis (Berliner), Subsp. Kurstaki Strain Sa-12	Streptomyces Griseoviridis Strain K61
Bacillus Thuringiensis, Subsp. Aizawai, Strain Abts-1857	Streptomyces Lydicus Wyec 108
Bacillus Thuringiensis, Subsp. Aizawai, Strain Sd-1372, Lepidopteran Active Toxin(S)	Trichoderma Harzianum Rifai Strain Krl-Ag2
Bacillus Thuringiensis, Subsp. Israelensis, Strain Am 65-52	Trichoderma lcc 012 Asperellum
Bacillus Thuringiensis, Subsp. Kurstaki, Strain Abts-351, Fermentation Solids and Solubles	Trichoderma lcc 080 Gamsii
	Ulocladium Oudemansii (U3 Strain)

Appendix D:

Pheromone Pesticides

Vision 3: Healthy Farms and Environment

- Goal 3: Kern County reduces risks associated with pesticide use
 - Indicator 1: Adoption of integrated pest management (IPM) practices
 - Measure 1: Use of pheromone pest control products

The following list of pheromone pest control products was retrieved using the “active ingredient class” query tool in PURWebGIS (<http://ziram.lawr.ucdavis.edu/PURwebGIS.html>). The exact products used will vary by year and county. This is a list of all pheromone pesticide products used in the state of California in 2014. Not all have necessarily been used in Kern County.

(3s, 6r)-3-Methyl-6-Isopropenyl-9-Decen-1-Yl Acetate
(3s, 6s)-3-Methyl-6-Isopropenyl-9-Decen-1-Yl Acetate
(E)-4-Tridecen-1-Yl-Acetate
(E)-5-Decen-1-Ol
(E)-5-Decenol
(E)-5-Decenyl Acetate
(E,Z)-7,9-Dodecadien-1-Yl Acetate
(Z)-4-Tridecen-1-Yl-Acetate
(Z)-9-Dodecenyl Acetate
(Z,Z)-11,13-Hexadecadienal
1,7-Dioxaspiro-(5,5)-Undecane
3,13 Octadecadien-1-Yl Acetate
E,E-8,10-Dodecadien-1-Ol
E-11-Tetradecen-1-Yl Acetate
E-8-Dodecenyl Acetate
Farnesol
Nerolidol
Z-11-Tetradecen-1-Yl Acetate
Z-8-Dodecenol
Z-8-Dodecenyl Acetate

Appendix E:

Pesticide Risk Categories

Vision 3: Healthy Farms and Environment

- Goal 2: Kern County reduces risks associated with pesticide use
 - Indicator 1: Adoption of integrated pest management (IPM) practices
 - Measure 3: Use of pesticides by estimated risk level

Higher Risk Pesticides – Non-fumigants

All pesticides included on the CalEnviroScreen 2.0's list of hazardous and volatile pesticides were categorized as "higher risk" in our analysis. This was a total of 69 pesticides, of which 59 were non-fumigants.

2,2-Dibromo-3-nitrilopropionamide (DBNPA)	Fosthiazate
2,2-dichlorovinyl dimethyl phosphate (DDVP, Dichlorvos)	Hydrogen cyanamide
Acephate	Imazalil
Acrolein	Linuron
Aldicarb	Malathion
Azinphos-methyl (Guthion)	Metalaxyl
Bromoxynil heptanoate	Methamidophos (Monitor)
Bromoxynil octanoate	Methidathion
Buprofezin	Methomyl
Carbaryl (Sevin)	Methyl isothiocyanate
Carbofuran	Methyl parathion
Chlorothalonil	Metrafenone
Chlorpyrifos	Molinate
Chlorthal-dimethyl (DCPA, Dacthal)	Myclobutanil
Ciprodinil	Naled
Clomazone	Oxydemeton-methyl
Cycloate (Ro-Neet)	Pendachloronitrobenzene (PCNB)
Diazinon	Propetamphos
Dichloran	Propoxur (Baygon)
Dimethoate	Pyrimethanil
Dimethyl disulfide (Paladin)	S,S,S-Tributyl phoshorotriithioate (DEF)
Endosulfan*	S-Ethyl dipropylthiocarbamate (EPTC)
Ethalfluralin	Sodium cyanide
Ethoprop	Sulfur dioxide
Fenamiphos	Thiram
Fenpropathrin	Triclopyr, butoxyethyl ester (TBEE)
Fenthion	Triclopyr, triethylamine salt (TEA)
Fludioxonil	Triflumizole
Flumioxazin	Trifluralin
	Ziram

Higher Risk Pesticides – Fumigants

All pesticides included on the CalEnviroScreen 2.0's list of hazardous and volatile pesticides were categorized as "higher risk" in our analysis. This was a total of 69 pesticides, of which 10 were fumigants.

1,3-Dichloropropene (Telone)
Chloropicrin
Dazomat
Metam-potassium (Potassium N-methyldithiocarbamate)
Metam-sodium
Methyl bromide
Phosphine
Propylene oxide
Sodium tetrathiocarbonate
Sulfuryl fluoride

Lower Risk Pesticides

All pesticides registered for use in California that were not included on the CalEnviroScreen 2.0's list of hazardous and volatile pesticides were included in our analysis as "lower risk pesticides." In 2014 this was a total of 263 pesticides, though this may vary slightly from year to year as pesticides are newly registered or removed from registration.

Appendix F:

California Code of Regulations, Title 3, Division 6, Chapter 1, Subchapter 3, Article 1

Vision 3: Healthy Farms and Environment

- **Goal 3:** Kern County reduces risks associated with pesticide use
 - **Indicator 1:** Adherence to pesticide use regulations
 - **Measure 3:** CDPR enforcement actions related to worker safety

California Code of Regulations (Title 3. Food and Agriculture) Division 6. Pesticides and Pest Control Operations

Division 6. Pesticides and Pest Control Operations Chapter 1. Pesticide Regulatory Program Subchapter 3. Agricultural Commissioner Penalties Article 1. Guidelines

6128. Enforcement Response to Violations.

(a) The commissioner shall comply with the provisions of this section each time an incident or violation of law or regulation occurs related to agricultural or structural use of pesticides or any use of a fumigant, to determine the appropriate enforcement response.

(b) For purposes of this section, and sections 6130 and 6131, the following terms are defined as follows:

“Compliance action” is an action that documents that certain behavior or an act is in violation of the law or regulations. The documentation may or may not allege the recipient committed the violation at issue. Compliance actions do not directly impose a monetary penalty. Compliance actions include violation notice; warning letter; documented compliance interview; or noncompliance noted on an inspection form. Compliance actions also include public protection actions such as cease and desist orders; seize or hold product or produce orders; and prohibit harvest orders.

“Decision report” is a written record of the basis for a commissioner’s decision not to take an enforcement action.

“Enforcement action” is an action with the potential to impose a monetary penalty or loss of a right or privilege initiated by a Notice of Proposed Action. Enforcement actions include administrative civil penalty; or disciplinary action (refuse, suspend, or revoke) against a county registration, certificate, or permit.

“Incident” is an occurrence in which one or more violations are discovered. An incident may be a single inspection or audit, a set of two or more inspections or audits related to the occurrence, or a pesticide episode investigation.

(c) After determining the violation class specified in Title 3, California Code of Regulations section 6130 or Title 16, California Code of Regulations section 1922, the commissioner shall respond to each incident with one or more of the enforcement responses listed below.

(1) Class A or Serious Violation

(A) A formal referral to the District Attorney, City Attorney, Circuit Prosecutor, or the Director or Structural Pest Control Board Registrar for a statewide licensing action.

(B) An enforcement action. If the enforcement response initially selected by the commissioner was a formal referral but the referral was declined, then the commissioner shall proceed with this enforcement response.

(2) Class B or Moderate Violation

(A) A formal referral to the District Attorney, City Attorney, Circuit Prosecutor, or the Director or Structural Pest Control Board Registrar for a statewide licensing action.

(B) An enforcement action. If the enforcement response initially selected by the commissioner was a formal referral but the referral was declined, then the commissioner shall proceed with this enforcement response.

(C) A compliance action with a decision report, provided there has not been a violation in Class A or B within two years of the current violation. In some instances, a compliance action may be taken in addition to the enforcement response in (2)(A) or (B), in which case a decision report is not required.

(3) Class C or Minor Violation Enforcement Response.

(A) An enforcement action; or

(B) A compliance action.

(d) If a decision report is required, the commissioner shall submit the decision report to the Director, within 60 days of the date of the initial compliance action, for concurrence. If the Director does not concur with the commissioner's decision, the Director shall notify the commissioner within 30 days of receipt of the decision report with the specific reasons for denial, and an enforcement action shall be taken by the commissioner. The commissioner shall retain a copy of the decision report for two years. A decision report shall contain:

(1) The identification of the respondent or case;

(2) A summary of the incident or act;

(3) The section(s) violated;

(4) The class of each violation pursuant to Title 3, California Code of Regulations section 6130 or Title 16, California Code of Regulations section 1922;

(5) An explanation of the circumstances that justify not taking an enforcement action;

(6) The date of decision; and

(7) The name of the Agency official responsible for the decision.

(e) In the case of a priority investigation, as defined in the 2005 Cooperative Agreement, dated April 2005, between the California Department of Pesticide Regulation, the California Agricultural Commissioners and Sealers Association, and the U.S. Environmental Protection Agency, Region IX, except in cases of intentional ingestion, the commissioner shall provide an opportunity to the District Attorney, City Attorney, or Circuit Prosecutor to participate in the investigation and/or pursue a civil or criminal action when a violation may have occurred.

NOTE: Authority cited: Sections 2281, 11456, 12781, 12976, and 15203, Food and Agricultural Code. Reference: Sections 11892, 12996, 12997, 12999.5, and 15202, Food and Agricultural Code; and Section 8617, Business and Professions Code.

6130. Civil Penalty Actions by Commissioners.

- (a) When taking civil penalty action on incidents or violations related to agricultural or structural use of pesticides and all uses of fumigants pursuant to section 12999.5 of the Food and Agricultural Code, county agricultural commissioners shall use the provisions of this section to determine the violation class and the fine amount. This section may also be used to determine the violation class and fine amount for violations involving other uses of pesticides.
- (b) County agricultural commissioners shall designate violations as "Class A," "Class B," or "Class C" using the following definitions:
- (1) A Class A violation is one of the following:
- (A) A violation that caused a health, property, or environmental hazard.
- (B) A violation of a law or regulation that mitigates the risk of adverse health, property, or environmental effects, and the commissioner determines that one of the following aggravating circumstances support elevation to Class A.
1. The respondent has a history of violations;
 2. The respondent failed to cooperate in the investigation of the incident or allow a lawful inspection; or,
 3. The respondent demonstrated a disregard for specific hazards of the pesticide used;
- (C) A violation of a lawful order of the commissioner issued pursuant to sections 11737, 11737.5, 11896, 11897, or 13102 of the Food and Agricultural Code.
- (2) A Class B violation is a violation of a law or regulation that mitigates the risk of adverse health, property, or environmental effects that is not designated as Class A.
- (3) A Class C violation is a violation of a law or regulation that does not mitigate the risk of an adverse health, property, or environmental effect, including, but not limited to, Title 3, California Code of Regulations, sections 6624 through 6628, and Food and Agricultural Code sections 11732, 11733, and 11761.
- (c) The fine range for each class of violation is:
- (1) Class A: \$700 to \$5,000.
- (2) Class B: \$250 to \$1,000.
- (3) Class C: \$50 to \$400.
- (d) When determining the fine amount within the fine range, the commissioner shall use relevant facts, including severity of actual or potential effects and the respondent's compliance history, and include those relevant facts in the notice of proposed action.
- (e) The commissioner shall send a copy of the notice of proposed action to the Director no later than the time the notice is provided to the respondent.
- (f) If the respondent requested and appeared at the hearing offered by the commissioner, the commissioner's decision shall include information concerning the person's right to appeal the decision to the Director.
- (g) The commissioner shall send a copy of the notice of final action to the Director no later than the time the notice is provided to the respondent.

Note: Authority cited: Sections 12781, 12976, and 15203, Food and Agricultural Code. Reference: Sections 11892, 12973, 12997, 12999.5, and 15202, Food and Agricultural Code; and Section 8617, Business and Professions Code.

6131. Actions Allowed Against Licensed or Certificated Employees.

(a) When bringing an enforcement action against an employee who failed to use personal protective equipment or other safety equipment as required by section 6702(c) or a pesticide product's labeling, the commissioner shall determine that all of the following conditions are met:

- (1) The employee person is licensed or certified pursuant to Chapter 14, Division 3, of the Business and Professions Code; Chapters 5 or 8, Division 6, of the Food and Agricultural Code; or Chapters 3.4 or 3.6, Division 7, of the Food and Agricultural Code;
- (2) The employer provided the equipment to the employee and the equipment was available at the work site in a condition that would have provided the safety or protection intended by the equipment;
- (3) The employer has implemented a written workplace disciplinary action policy requiring the employee to use the equipment;
- (4) The employee has acknowledged by signature having read and understood the employer's written workplace disciplinary action policy for failure to use the equipment; and,
- (5) The employer has complied with applicable training requirements of this Division prior to the time the employee failed to use the equipment.

(b) A Notice of Proposed Action to fine an employee for failure to use personal protective equipment must include a copy of the text of subsection (a).

NOTE: Authority cited: Sections 12781, 12976, and 15203, Food and Agricultural Code. Reference: Sections 11892, 12973, 12997, and 15202, Food and Agricultural Code; and Section 8616.9, Business and Professions Code.

Copyright © 2013 State of California

Appendix G:

Surface Water Monitoring Stations in Kern County

Vision 3: Healthy Farms and Environment

- **Goal 3:** Kern County's water resources are conserved and support ecosystem health
 - **Indicator 1:** Dissolved nitrate in Kern County water systems
 - **Measure 1:** Dissolved nitrate detected in Kern County surface water

The following table shows all the surface water quality monitoring stations in Kern County that were included in our analysis. These include all stations sampled for nitrate at least once in Kern County between 1972 and 2013. This station list was generated by the California Department of Water Resource's Water Data Library.

The largest number of water samples for nitrate came from four stations – CALIFORNIA AQUA A.D. EDMONSTON (sampled 1972-1990, 2006), CALIFORNIA AQUA A CHECK 29 (sampled 1972-2013), CALIFORNIA AQUEDUCT AT CHECK 41 (sampled 1988-2013), and COASTAL B A CHECK 5 (sampled 1972-1990).

Station numbers with a single asterisk* beside them were sampled for nitrate in less than 5 years total between 1972 and 2013.

Station numbers with a double asterisk** beside them were sampled for nitrate in 2013.

“Pump-In Projects” are sites where local groundwater is introduced into the State Water Project (SWP). The pump-in stations on this list may include a mix of both surface and groundwater.¹

Long Station Name	Short Station Name	Station Number
Arvin Edison Pump in	AE Pump in	GKA02773**
Cal Aqu at mi 197.05, Check 23	Check 23	KA019705**
Cal Aqu at mi 209.80, Semi Tropic Turnout	Semitropic pump-in	KA020980*
Cal Aqu at mi 241.02, Kern River Intertie	KA024102	KA024102*
CALIFORNIA AQUA A.D. EDMONSTON	KA029339	KA029339
CALIFORNIA AQUA A CHECK 29	Check 29	KA024454**
CALIFORNIA AQUEDUCT AT CHECK 24	KA020794	KA020794**
CALIFORNIA AQUEDUCT AT CHECK 28	KA023811	KA023811**
CALIFORNIA AQUEDUCT AT CHECK 41	Check 41	KA030341
Check 25	Check 25	KA021779**
Check 27	Check 27	KA023173**
Check 39	Check 39	KA029021
COASTAL B A CHECK 5	KC001220	KC001220
CROSS VALLEY CANAL	Cross Valley Canal	GKA23805*
Cross Valley Canal Pumpin	Cross Valley	GKA02380* **
DEVILS DEN	Check 4	KC000934
Kern Water Bank Pump in	KWB pump in	GKA02382**

¹ California Department of Water Resources, Division of O&M, O&M Pump-In Project Monitoring. Retrieved April 11, 2016 from <http://www.water.ca.gov/swp/waterquality/PumpIns/index.cfm/>

Long Station Name	Short Station Name	Station Number
NON-PROJECT IMPORT STATION (WHEELER RIDGE)	GKA26966	GKA26966*
NON-PROJECT IMPORT STATION (WHEELER RIDGE)	GKA27210	GKA27210*
NON-PROJECT IMPORT STATION (WHEELER RIDGE)	GKA27231	GKA27231*
NON-PROJECT IMPORT STATION (WHEELER RIDGE)	GKA27253	GKA27253*
NON-PROJECT IMPORT STATION (WHEELER RIDGE)	GKA27280	GKA27280*
NON-PROJECT IMPORT STATION (WHEELER RIDGE)	GKA27375	GKA27375*
NON-PROJECT IMPORT STATION (WHEELER RIDGE)	GKA27728	GKA27728*
Semi Tropic 3 arsenic monitoring	Semi Tropic 3 Pumpin	KA020699*
Semitropic 2 turn in	Semitropic 2 pump in	GKA02098**
Semitropic 3 turnin	Semitropic 3 pump in	GKA02070**
West Kern 3	WK 3	KA022407*
West Kern Pumpin	West Kern Pumpin	GKA24002* **
Wheeler Ridge pumpkin 270.24	WRM pumpkin 270.24	GKA27024*
Wheeler Ridge pumpkin 276.09	WRM pumpkin 276.09	GKA27609*
Wheeler Ridge pumpkin 280.14	WRM pumpkin 280.14	GKA28014*
Wheeler Ridge pumpkin 286.89	WRM pumpkin 286.89	GKA28689*

Appendix H:

Groundwater Sampling in Kern County

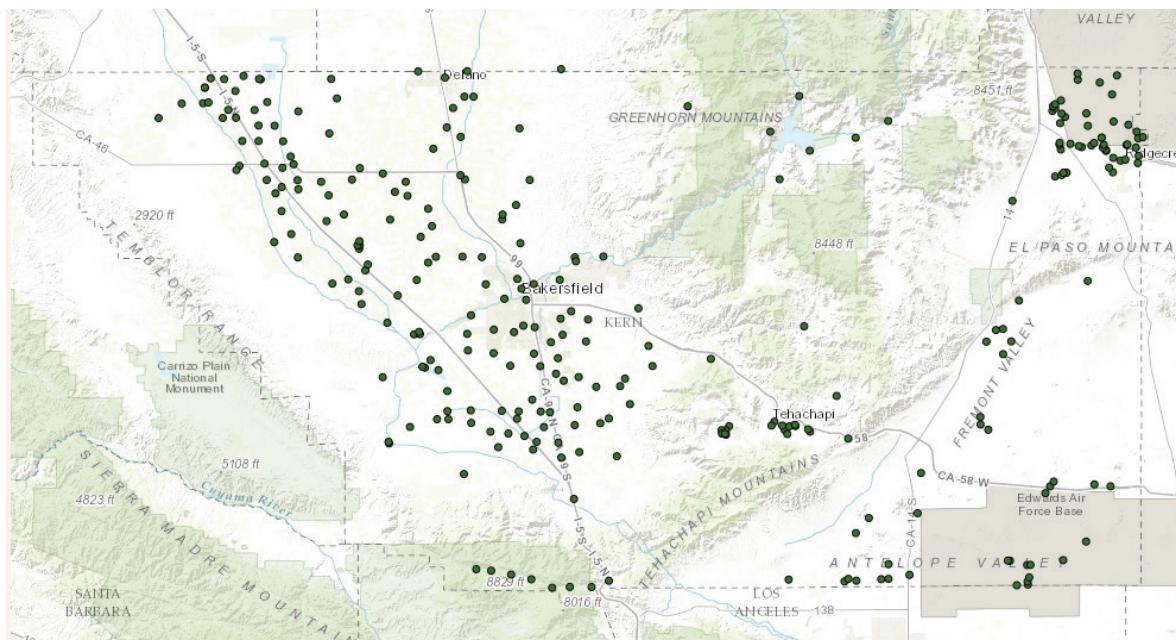
Vision 3: Healthy Farms and Environment

- Goal 3: Kern County's water resources are conserved and support ecosystem health
 - Indicator 1: Dissolved nitrate in Kern County water systems
 - Measure 2: Dissolved nitrate detected in Kern County groundwater

The following map shows the location of USGS groundwater sampling sites in Kern County from 1980 to 2014.

Groundwater sampling sites in Kern County 1980-2014

Source: The Water Quality Portal (sponsored by the United States Geological Survey (USGS), United States Environmental Protection Agency (EPA), and the National Water Quality Monitoring Council (NWQMC)¹)



The following figure shows the total number of samples tested each year and the percentage of those samples in which nitrate was detected at any level, including many samples safely below the maximum contaminant level (MCL) of 45 mg/L.

This figure does not give any information about nitrate levels in groundwater, but is provided as context for the data in the main text (Figure 50: Dissolved nitrates in Kern County groundwater 1991-2013).

Depending on the method of sampling, the amount of nitrate in water required for detection ranges from 0.443 to 4.43 mg/L. Natural background levels of nitrate in groundwater can be as high as 8.9 mg/L.

¹ The Water Quality Portal serves data collected from 400 state, federal, tribal, and local agencies

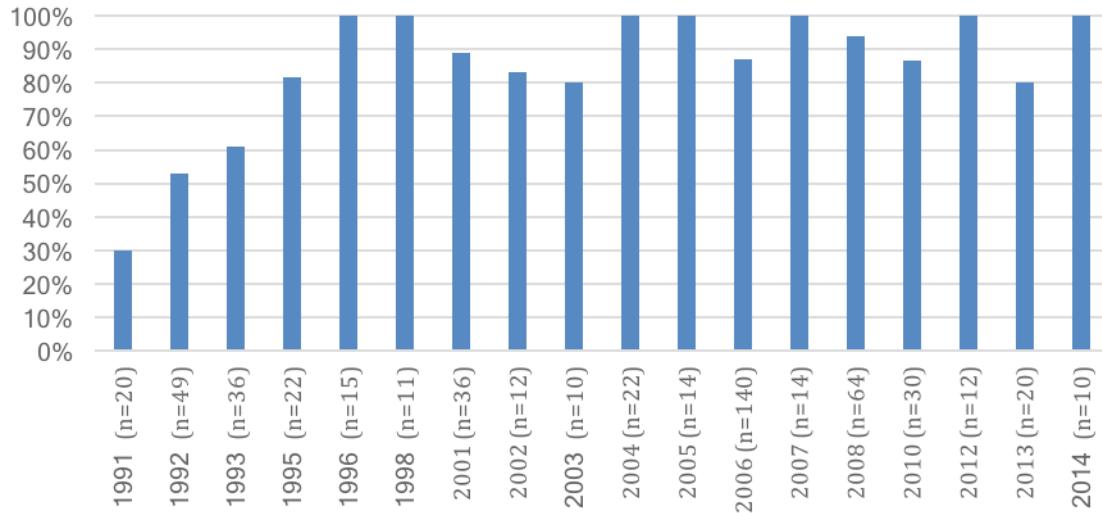
Percentage of groundwater samples in which nitrates were detected in Kern County (1991-2014)

Source: Source: United States Geological Survey (USGS), National Water Information System (NWIS), queried via the Water Quality Portal (WQP), a collaborative tool of the National Water Quality Monitoring Council, the USGS, and the EPA.

Percent of Groundwater Samples with Nitrates Detected

Kern County (1991-2014)

n=number of samples taken each year



Appendix I:

Annual Evapotranspiration Values for California Crops (ETc)

Vision 3: Healthy Farms and Environment

- Goal 3: Kern County's water resources are conserved and support ecosystem health
 - Indicator 2: Agricultural water use in Kern County
 - Measure 2: Average water requirements of harvested crops in Kern County

The ETc values used in this report were developed by California Polytechnic State University's Irrigation Training and Research Center (IRTC) using the method outlined by the Food and Agriculture Organization of the United Nations (FAO).¹ Values for additional crop types in wet, dry, and average years can be viewed on IRTC's website.² The Kern County Food Systems Assessment uses dry year ETc values.

ETc values are commonly expressed in acre inches of water, or the amount of water it takes to cover an acre of land. ETc is crop specific and based on both where the crop is grown (it's CIMIS ETo or evapotranspiration zone³) and how it is grown (each estimate includes assumptions about crop density, soil type, irrigation type, etc.). The assumptions made in developing IRTC's ETc values for California crops can be viewed on their website.⁴

The annual ETc values developed by IRTC include evaporation during non-growing periods, which is one reason these values may be higher than other published values or than actual irrigation use.

The first column in the table below lists the crops in our analysis, as listed in the Kern County Agricultural Commissioner's annual Crop Reports. The second column is the closest match for that crop in IRTC's database on ETc values. The third column is the average annual ETc for that crop in CIMIS ETo zones 14 and 15, where much of the agriculture in Kern County takes place.

The map below shows the location of CIMIS ETo zones.

Crop	Source of ETc value in IRTC database	Annual ETc in acre inches, dry year estimate
Crop		Average of Zones 14 & 15
Alfalfa Hay	Alfalfa Hay and Clover	51.1
Almonds	Almonds	44.3
Grapes	Grape vines with 80% canopy	32.3
Silage and Forage	Grain and grain hay	18.5
Wheat	Grain and grain hay	18.5
Pistachios	Pistachio	41.0
Citrus	Citrus, no ground cover	44.1
Grain Hay	Grain and grain hay	18.5
Potatoes	Potatoes, Sugar Beets, Turnips, etc.	38.3
Barley	Grain and grain hay	18.5
Tomatoes, Processing	Tomatoes and peppers	27.9

1 Food and Agriculture Organization of the United Nations. (1998). *Crop evapotranspiration – Guidelines for computing crop water requirements – FAO Irrigation and drainage paper 56*. Retrieved April 11, 2017 from <http://www.fao.org/docrep/X0490E/X0490E00.htm>

2 As of April 11, 2017: <http://www.itrc.org/etdata/etmain.htm>

3 California Irrigation Management Information System (CIMIS)'s California evapotranspiration zones

4 As of April 11, 2017: <http://www.itrc.org/etdata/explanation.htm>



Appendix J:

Accidents reported to OSHA for Support Activities for Crop Production (NAICS 1151) in Kern County

Vision 3: Healthy Farms and Environment

- **Goal 3:** Kern County's food systems workers are part of a safe and fair work environment
 - **Indicator 1:** Agricultural injuries, illnesses, and fatalities in Kern County
 - **Measure 1:** Occupational accidents reported to OSHA – Support activities for crop production (NAICS 1151)

The following table lists the OSHA description and keywords for each reported accident involving support activities for crop production in Kern County between 2002 and 2016. Fatalities are in red.

2002	Event description	Event keywords
21-Jan-02	Employee killed when leg pinned between fork lift and bin	Embolism,lung,storage bin,heart attack,caught between,industrial truck,laceration,leg
11-May-02	Employee injured when run over by tractor	Fracture,crop shredder,clutch,farm machinery,struck by,tractor,run over,gear
9-Jul-02	Employee burns hand on moving conveyor belt	Arm,conveyor,belt,caught between,finger,hand,burn
20-Oct-02	Employee injured when he falls from a ladder	Extension ladder,ladder,slip,back,abrasion,fall,contusion
21-Oct-02	Employee falls from ladder and fractures pelvis	Ladder,fall,fracture,pelvis,agriculture
25-Oct-02	Employees burned when splashed with hot asphalt	Burn,asphalt,roof,ppe,flying object,cleaning
27-Oct-02	Employee finger amputated while cleaning press tamper	Amputated,finger,work rules,caught by,cotton gin,press
2003	Event description	Event keywords
15-Jan-03	Employee cut leg on unpadded emergency brake	Brake,industrial truck,laceration,leg
13-Feb-03	Employee suffers amputation	Battery,amputated,finger,hoist,industrial truck,nip point,guide post
31-Mar-03	Employee suffers multiple fractures after truck overturns	Overturn,truck,fracture,ditch
24-Jun-03	Employee amputates finger in stitching machine	Amputated,finger,guard,work rules,machine operator,caught between,sealing machine
7-Oct-03	Employee falls from trailer	Ankle,trailer,fall,slip,run over,tire,brake
19-Oct-03	Employee sustains fracture when struck by forklift	Fracture,caught between,industrial truck,struck by,foot

2004	Event description	Event keywords
8-Jan-04	Employee is injured while dismounting forklift	Fracture,slip,driver,industrial truck,fall,arm
21-Jan-04	Laborer sprains back in fall through roof	Agriculture,fall,laceration,sprain,roof,roof opening,mouth,back,fall protection,work rules
5-Feb-04	Employee's leg fractured after being struck by forklift	Fracture,industrial truck,struck by,leg
11-Aug-04	Employee hands caught between truck frame and trailer	Trailer,hand,caught between,fracture
31-Aug-04	Employee's arm and hand are injured in a conveyor	Burn,food preparation,agriculture,caught by,laceration,conveyor,manual mat handling,arm,hand
6-Sep-04	Employee's leg broken in vehicle collision	Fracture,harvester,industrial truck,laceration,truck,struck by,motor vehicle,leg
10-Sep-04	Employee suffers amputation when caught in conveyor	Amputated,agriculture,farm machinery,caught by,conveyor,toe
1-Nov-04	Employee killed in tractor rollover	Crushed,roll-over,tractor,farm machinery,ditch
10-Dec-04	Employee fractures leg when struck by bin	Struck by,fracture,leg,ejected,manual mat handling,loading,trailer ,laceration
22-Dec-04	Employee is injured when struck by industrial truck	Farm machinery,pallet,industrial truck,struck by,leg,ankle,dislocated
26-Dec-04	Employee is killed by rotating arm of press machine	Head,rotating parts,cleaning,struck by,cotton,press
2005	Event description	Event keywords
14-Mar-05	Employee is killed when run over by tractor	Tractor,farm machinery,agriculture,run over
20-May-05	Mechanic amputates finger in filling machine chain	Chain,amputated,agriculture,finger,mechanic,lockout,caught between,nip point
20-Jul-05	Employee suffers from heat stroke while working in field	Heat stroke,agriculture,heat
21-Jul-05	Employee suffers from heat exhaustion and later dies	Heat exhaustion,heat stroke,agriculture,heat
25-Jul-05	Employee amputates finger in drive belt	Maintenance,amputated,repair,belt,finger,caught between
13-Oct-05	Employee fractures leg and foot when leaving forklift	Farm machinery,industrial truck,tractor,trailer,footings,foot,fracture,leg

2006	Event description	Event keywords
6-Jan-06	Employee is injured in roof collapse	Roof collapse,fracture,roof,demolition,tibia,trailer,leg
24-Jan-06	Forklift truck operator overturns vehicle and amputates toe	Amputated,roll-over,speeding,work rules,equipment operator,overhead guard,industrial truck,mech mat handling,toe,lost control
8-Apr-06	Employee is injured in forklift accident	Warehouse,machine operator,struck against,industrial truck,laceration,storage rack
10-Apr-06	Employee is injured using shotgun	Gunshot,amputated,hand,finger
17-May-06	Employee falls through roof and fractures wrists	Fracture,roof,collapse,agriculture,struck against,fall,work surface,wrist
10-Jul-06	Mechanic sustains fracture to arm when caught in conveyor	Mechanic,repair,maintenance,food preparation,lockout,conveyor belt,fracture,roller conveyor,unguarded,work rules
2-Dec-06	Employee's ankles are fractured when cotton gin starts up	Fracture,maintenance,agriculture,work rules,cleaning,machine operator,lockout,caught between,cotton gin,point of operation
28-Dec-06	Employee's finger is amputated by sprayer motor	Amputated,belt,finger,lockout,caught between,pulley
2007	Event description	Event keywords
16-Apr-07	Two employees burned by flaming gasoline	Burn,maintenance,agriculture,fire,explosion,truck,face,gasoline,hand,gas can
15-Sep-07	Employee's arm fractured when caught in machine	Caught by,jammed,conveyor,arm
2-Oct-07	Employee's shoulder is fractured by boom from spray rig	Agriculture,struck by,falling object,fracture,boom,spraying rig,slip,shoulder
30-Oct-07	Employees suffer severe burns in explosion	Burn,fire,explosion,smoke,tractor,cotton,smoke inhalation
2008	Event description	Event keyword
5-Feb-08	Employee's finger is amputated by chain and sprocket	Chain,amputated,finger,lockout,sprocket,hand tool,unguarded
6-May-08	Employee burned by rotating shaft	Burn,rotating parts,repair,welding,lockout,conveyor

10-May-08	Farm worker sustains fractured leg in fall from trailer	Agriculture,farm machinery,tractor,trailer,inattention,lost balance,fall,caught by,tire,fracture
16-May-08	Employee is injured while rigging tank	Tank,loading,unstable load,trailer,crane,tag line,rigging,suspended load
15-Jun-08	Employee receives second and third degree burns	Burn,fire,smoke,flammable liquid
30-Jun-08	Employee is killed when caught between truck and tractor	Caught between,run over,tractor,asphyxiated,chest
3-Jul-08	Employee amputates finger in conveyor belt	Amputated,belt,machine operator,conveyor belt,hand,finger,belt conveyor,machinist
9-Jul-08	Employee sustains heat illness when exposed to heat	Agriculture,heat exhaustion,heat
10-Jul-08	Employee sustains heat exhaustion due to exposure to heat	Heat exhaustion,agriculture,high temperature,cardiovasc system
10-Jul-08	Employee dies from heat stroke	Heat stroke,heat exhaustion,agriculture,high temperature
11-Jul-08	Employee experiences possible heat illness	Agriculture,high temperature,heat exhaustion,heat stroke
18-Jul-08	Employee trips and fractures arm in fall	Tripped,fall,fracture,arm,inattention,caught by
20-Jul-08	Four employees are exposed to carbon monoxide	Agriculture,inhalation,carbon monoxide,poisoning
27-Aug-08	Employee hand is crushed in dumping machine	Dumper,crushed,hand,contusion,caught by,machine operator
17-Sep-08	Employee is killed when crushed by forklift mast	Chest,ind trk operator,agriculture,caught between,crushed,industrial truck,mech mat handling
18-Sep-08	Employee's fingers are amputated in cutting machine	Amputated,finger,rotating knife,lockout,struck by,nip point
30-Oct-08	Employee drowns, not work related	Drown
30-Dec-08	Worker amputates finger while cutting roses with saw	Machine operator,saw,blade,caught by,rotating knife,glove,hand,severed,amputated,finger

2009	Event description	Event keywords
27-Feb-09	Employee is injured when struck by relief disk	Pressure piping, valve, laceration, struck by, face, water, flying object
16-Mar-09	Employee falls from atv	Fall, vehicle, lost control, overturn
24-Mar-09	Employee's fingertip is amputated by chain and sprocket	Chain, amputated, finger, glove, food packaging mach, conveyor, sprocket, nip point
29-Apr-09	Employee's finger is struck by object	Finger, struck by
9-May-09	Employee falls while typing trees	Agriculture, fall
23-Jun-09	Employee amputates hand in rotating fan blades	Maintenance, amputated, fan blade, mechanic, struck by, spraying rig, hand, lubricating
15-Jul-09	Worker dies from myocardial infarction	Heart, heart attack, heat, agriculture
11-Aug-09	Employee's finger is pinched by pipe, later amputated	Agriculture, caught between, amputated, finger, irrigation pipe, pipe, inattention
3-Oct-09	Agricultural worker sustains lacerations in twin augers	Agriculture, farm machinery, control lever, lost balance, fall, caught by, auger, laceration, neck, chest
7-Oct-09	Metal rod impales farm worker	Agriculture, head, metal bar, impaled
5-Nov-09	Employee receives electrical shock from powerline	Tree pruner, overhead power line, electric shock, shock, work surface, neck
2010	Event description	Event keywords
24-May-10	Employee injured in agricultural accident	Fracture, fall, struck by, tractor, arm
29-May-10	Employee injures hand in shot gun shell accident	Wrench, amputated, finger, truck, pipe
5-Jun-10	Employee fractures neck in atv accident	Fracture, neck, vehicle, tree, head
8-Jun-10	Employee's hand caught in straw blanket machine	Laceration, fracture, hand, finger, forearm, arm, baler
22-Jul-10	Employee suffers heat exhaustion	Heat, heat stroke, fall
25-Sep-10	Employee dies in bankout accident	Head, crushed, struck by
3-Oct-10	Employee's leg is lacerated by almond harvester	Agriculture, run over, laceration, leg, degloved, farm machinery

27-Dec-10	Farm worker sustains brain injury in fall from trailer	Agriculture,farm machinery,trailer,riding on equipment,uneven ground,lost balance,fall,struck against,head,brain
2011	Event description	Event keywords
17-Jan-11	Employee is injured when arm is caught in conveyor	Wrench,maintenance,amputated,belt,mechanic,caught by,thumb,conveyor,extension handle,hand tool
7-Feb-11	Employee's leg is fractured when run over by trailer	Run over,leg,tibia,agriculture,trailer,tire,tree,fracture
18-Feb-11	Employee sustains multiple fractures when run over by trailer	Agriculture,trailer,run over,struck by,motor vehicle,fracture,obstructed view
29-Mar-11	Employee amputates thumb in conveyor	Chain,maintenance,amputated,cleaning,thumb,caught between,conveyor,sprocket,nip point
22-Apr-11	Employee suffers serious injury from chain saw	Laceration,chain saw,saw,struck by,tree
10-May-11	Employee fractures leg in fall from ladder	Fracture,leg,fall,ladder,harvester,agriculture,lost balance,load shift
25-May-11	Employee is injured when trailer falls on him	Caught between,falling object,trailer,back,fracture,agriculture
29-May-11	Employee fingers are amputated in conveyor belt	Maintenance,amputated,finger,machine operator,lockout,caught between,nip point,pulley,conveyor belt
7-Jun-11	Employee is killed in fall from ladder at peach orchard	Agriculture,fall,fracture,rib,ladder,tree
11-Jun-11	Employee is injured in fall from tree limb	Tree,tree limb,ladder,tree trimming,agriculture,fall,laceration,head ,struck against,leg
14-Jun-11	Employee's thumb is crushed in silo auger	Crushed,hand,silo,fracture,thumb,auger,irrigation equipment,lockout,rotating parts
6-Jul-11	Farm worker sustains heat-related illness	Heat,agriculture,driver,heat stroke,heat exhaustion,spraying rig,pesticide
6-Jul-11	Employee suffers possible heat illness while picking peppers	Heat exhaustion,agriculture,harvester
16-Jul-11	Employee losses consciousness in fertilizer tank	Agriculture,asphyxiated,confined space,tank,tank cleaning,oxygen deficiency,unconsciousness

3-Aug-11	Employee sustains heat-related illness	Agriculture,heat,heat exhaustion,heat stroke
30-Aug-11	Employee faints from heat exhaustion	Agriculture,heat,heat exhaustion,heat stroke,fainted
15-Sep-11	Employee falls from ladder and is injured	Ladder,lost balance,fall,back,neck
22-Sep-11	Employee gets struck on the knee by forklift tine	Knee,industrial truck,struck against,laceration,reflective vest
12-Oct-11	Two employees are overcome by fumes; one dies	Drain pipe,clogged,asphyxiated,hydrogen sulfide,chemical vapor,toxic fumes,overexposure,lung,inhalation,agriculture
18-Nov-11	Employee is injured when pinned by trailer	Tractor,trailer,agriculture,struck by,pinned,backing up,inattention,communication,fracture,abdomen
9-Dec-11	Employee is injured when struck by falling equipment	Head,abdomen,agriculture,loading,struck by,abrasion,contusion,falling object,trailer truck,unstable load
30-Dec-11	Employee is killed when run over by loader truck	Farm machinery,loader,loader bucket,truck,wheel,run over
2012	Event description	Event keywords
16-Jan-12	Employee injured using a pruner	Laceration,thumb,amputated
3-Apr-12	Farm laborer sustains laceration in fall from ladder	Agriculture,ladder,tree,tree limb,fall,impaled,laceration,arm
25-Apr-12	Worker fractures ankle in fall from all-terrain vehicle	Fracture,agriculture,motorcycle,fall,fruit packing,lost balance,lost control,motor vehicle,ankle
7-Jun-12	Employee is hospitalized with hyperventilation syndrome	Headache,vomit,dizziness
13-Jun-12	Employee falls breaking ankle, loses consciousness	Migrant farm worker,fall,fracture,ankle,slippery surface,unconsciousness
21-Jun-12	Employee partially amputates right middle finger in conveyor	Farm machinery,amputated,finger,conveyor,glove
20-Jul-12	Farm worker experiences seizure	Agriculture,epilepsy,heat exhaustion
27-Jul-12	Tractor operator is burned when hydraulic fluid catches fire	Burn,leak,inadequate maint,agriculture,equipment operator,fire,hydraulic fluid,earthmoving equip,equipment failure,hydraulic line

18-Sep-12	Employee loses finger in harvester accident	Amputated,finger,tractor,chain,harvester,tree,health care facility
24-Oct-12	Two refrigeration technicians sustain corneal burns	Eye,leak,maintenance,anhydrous ammonia,corrosive,chemical burn,refrigerator,face,pressure release
25-Nov-12	Powered industrial lift truck hits and injures worker	Struck by,pit,laceration,fracture,pelvis,agriculture,fruit packing
2013	Event description	Event keywords
15-Jan-13	Employee gets arm crushed while operating a forklift	Shock,crushed,industrial truck,arm
12-Apr-13	Employee sustains serious injuries from truck accident	Knee,fracture,amputated,tibia,health care facility,crushed,truck,fall,struck by,leg
22-Jul-13	Employee suffers from heat exhaustion	Heat exhaustion,migrant farm worker
22-Jul-13	Employee fractures finger on machine clamp, later amputated	Migrant farm worker,farm machinery,amputated,finger,fracture,laceration,untrained,machine--misc
24-Jul-13	Employee fractures leg when struck by pipe	Fracture,irrigation pipe,pipe,irrigation equipment,falling object,leg
1-Aug-13	Worker suffers heat illness while removing almonds from tree	Agriculture,fatigue,heat,heat exhaustion,heat stroke,dizziness,migrant farm worker
12-Aug-13	Employee is injured when run over by machinery	Run over,agriculture,asphyxiated,contusion,knee,lung,nose,laceration
8-Sep-13	Employee fractures leg in farming vehicle accident	Fracture,leg,tibia,spraying rig,traffic accident,poor visibility,tractor,farm machinery
26-Sep-13	Employee suffers seizure, not work related	Migrant farm worker,unconsciousness
12-Nov-13	Employee amputates thumb and finger on cutting machine	Maintenance,amputated,repair,finger,farm machinery,mechanic,thumb,nip point,automatic restart,machine--misc
2014	Event description	Event keywords
14-Jan-14	Employee's foot is struck by falling tree and is fractured	Fracture,harvester,tree,struck by,falling object,foot,unstable position
12-Feb-14	Worker is caught by power take-off and sustains fracture	Fracture,belt,agriculture,finger,guard,farm machinery,caught by,lockout,pulley,power take-off

20-Feb-14	Employee receives multiple burns from electricity	Burn,overhead power line,industrial truck,electric shock,struck by,elevated work plat
2015	Event description	Event keywords
9-Feb-14	An employee dies of a heart attack while working in an orange	Agriculture,heart attack,heart
2016	Event description	Event keywords
26-Jul-16	Employee harvesting grapes dies from heart attack	Heart attack,heat exhaustion
8-Nov-16	Employee suffers heart attack at vineyard prior to harvesting	Heart attack

