AGRICULTURE

INTRODUCTION

Farms and ranches cover more than 92% of unincorporated Yolo County, providing communitywide economic and employment benefits. Given the scale of these activities, it is not surprising that agriculture generates almost half of the GHG emissions within the unincorporated area in both the 1990 and 2008 emission inventories. (The inventories do not include emissions from each of the four cities, UC Davis, tribal lands, special districts, and/or federal and State-owned lands. Each of these entities is responsible for adopting their own inventories and climate action plans.)

Within the agricultural sector, nitrous oxide resulting from the application of nitrogen fertilizers contributes more than a third of all farm GHG emissions (See Figure 3-3). Energy consumed by farm equipment and irrigation pumps produces another third of the emissions in this sector. Rice cultivation and livestock generate methane gas and contribute approximately 10% of total GHG emissions each. Crop residue burning and application of lime, urea, and pesticides make up the remainder.

As shown in Figure 3-4, although farming accounts for 87% of the Yolo County land area, it only produced 14% of total countywide GHG emissions in 1990. This raises an important point often overlooked in the climate change debate. Although agriculture contributes a small proportion of overall GHG emissions, it has an unrecognized value that greatly outweighs its minor impact on climate change. The protection of farmland and open space limits the spread of urban development, thereby avoiding uses that create significantly higher levels of GHG emissions.

Urban land accounted for 22,471 acres in Yolo County in 1990. The four cities had total GHG emissions in 1990 of 1,382,444 MT CO_2e, or approximately 61.5 MT CO_2e per acre of urban development. In contrast, intensive (non-livestock) agriculture occurred on 476,483 acres in 1990.

Figure 3-3: Agricultural Greenhouse Gas Emissions by Sub-Sector in 1990

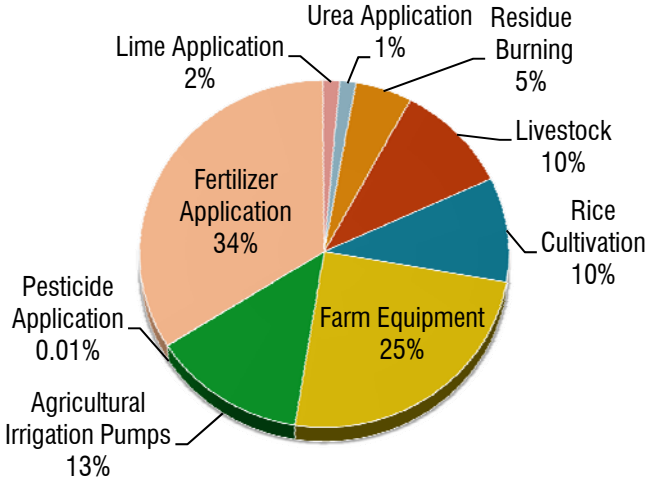
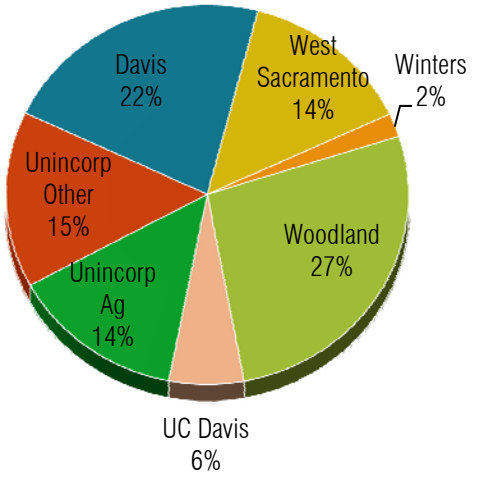


Figure 3-4: Greenhouse Gas Emissions by Jurisdiction in 1990



Excluding livestock, agricultural GHG emissions in 1990 amounted to 262,829 MT CO_2e, or approximately 0.6 MT CO_2e per acre of farmland. Although the calculations used here are very broad, they generally indicate that each acre of agriculture and open space conserved saves nearly 100 times the amount of GHG emissions that would result if the land were converted to urban use.

The CAP includes measures to assist farmers in voluntarily reducing their share of overall emissions; however, the CAP also recognizes the valuable contributions made by farmland and open space in providing a positive alternative to more adverse land use patterns. To that extent, new programs that assist new farmers to acquire land and establish operations, as well as those that help to keep agricultural land affordable for existing farmers (i.e., farm easements) will strengthen the County's ability to manage urban development and prevent higher GHG levels. By emphasizing its agricultural traditions, Yolo County is well poised to provide carbon sequestration and other solutions to offset the emissions of an increasingly urbanized region.

The following pages identify six measures that effectively reduce agricultural emissions. Each of the six primary actions, as well as the six secondary measures, relies on voluntary participation from the farming community through the use of public outreach programs and/or financial incentives. None of these measures place any new mandates on agriculture.

The first measure proposes a technical assistance program to help farmers reduce nitrogen fertilizer inputs. The second measure seeks to increase fuel efficiency in tractors and other farm equipment. The third measure reduces irrigation emissions by encouraging improved pump efficiency and the conversion to solar-powered pumps. These three measures reduce farm operating costs while also reducing emissions.

The fourth measure reduces methane emissions in confined livestock operations. The County will help owners find funding to establish "biogas" control and renewable energy systems. These in turn provide local air quality benefits.
The fifth measure acknowledges international and federal efforts to eliminate the use of methyl bromide, a fumigant pesticide that depletes the Earth's ozone layer.

The final measure addresses carbon sequestration in agricultural and open space landscapes. The County proposes to expand existing riparian reforestation and hedgerow programs. These actions will also advance water quality and habitat protection efforts. The County will also develop a program to identify the sequestration potential of new orchards and other permanent crops.

MEASURE A-1:
Reduce nitrogen fertilizer application rates

Measure Description

Using organic or mineral nitrogen fertilizers is essential to maintain soil fertility and provide profitable yields. While these fertilizers are necessary, excessive application generates large amounts of nitrous oxide, a potent GHG. The purpose of this measure is to create a collaborative outreach program to provide information to farmers to allow them to optimize nitrogen application rates, decrease fertilizer input costs, maintain crop yields, and decrease nitrous oxide emissions.

In Yolo County, farmers have successfully reduced nitrogen application rates by 19% since 1990. Farmers identify increased fertilizer costs as the primary motivation behind this trend. Agricultural extension staff and university agronomists believe that additional reductions are possible.

Optimal nitrogen fertilizer application rates vary by crop type. Table 3-2 presents findings from research conducted in Yolo County by University of California - Davis agronomists. Their findings indicate that an additional 25% reduction from current (2008) application rates would minimally affect crop yield for corn, rice, sunflower, and wheat. However, crop yield for tomatoes and safflower would be adversely affected. Similar analyses conducted for orchard crops (e.g., almonds) also found potential for reduced nitrogen input. Crop rotation is also an important factor. For instance, alfalfa can fix nitrogen in the soil that then reduces the need for the next crop in the rotation.

Nitrogen application rates also vary depending on a number of other variables, including timing, source, and irrigation method. Because of the uncertainty involved, historically there has been a tendency to apply more nitrogen than is needed. In other cases, such as alfalfa, nitrogen is applied not as a fertilizer, but as a source of phosphorous.

The County intends for this program to provide a clearinghouse of information that helps farmers voluntarily reduce nitrogen fertilizer application. The program seeks to disseminate knowledge about technologies

Table 3-2: Estimated Effects of a 25% Reduction in Nitrogen Fertilizer Application on Crop Yield and GHG Emissions in the Sacramento Valley by Crop Type

Crop Type	Corn	Rice	Safflower	Sunflower	Tomato	Wheat
Relative Change in Crop Yield (%)	-0.20*	-0.03*	-12.90	-0.04*	-4.00	-0.10*
Change in GHG emissions (MT $C0_2e$/acre/year)	-0.28	-0.38	-0.01*	-0.25	-0.32	-0.06*

Source: De Gryze, Steven, Rosa Catala, Richard E. Howitt, and Johan Six (University of California, Davis). 2008. Assessment of Greenhouse Gas Mitigation in California Agricultural Soils. California Energy Commission, PIER Energy-Related Environmental Research. CEC-500-2008-039.

* Although these figures were cited in the research, they were noted as statistically insignificant.

and best practices, and ensure that future research addresses growers' specific questions and concerns. If successful, the program could create a win-win scenario that improves farm economic efficiency and reduces GHG emissions and non-point source water pollution.

Reducing nitrogen fertilizer application rates can improve farm profits for certain crop types. Fertilizer costs money, and reducing the amount used will lower per-acre production costs. When a reduction in fertilizer application minimally decreases crop yield in some cases, fertilizer cost savings can be greater than the decreased revenue from smaller yield.

Beyond the potential financial and emission reduction benefits, this measure provides air and water quality benefits. In particular, it can also assist growers to contribute to the State's non-point source water pollution efforts.

This measure assumes that farmers will reduce nitrogen fertilizer application by an average of 6% below current (2008) levels by 2020, reducing GHGs by 4,232 MT CO_2e/year. For 2030, the measure assumes that average application rates will be reduced 15% below 2008 levels, which would result in a GHG reduction of 10,294 MT CO_2e/year.

2020 GHG Reduction Potential:

4,132 MT CO_2e (2%)

2030 GHG Reduction Potential:

10,051 MT CO_2e (2%)

Community Co-Benefits:

Reduce Costs
Improve Water Quality
Improve Air Quality
Sustain Agriculture

Applicability:

Agriculture

ACTION		RESPONSIBILITY	TIMEFRAME
A	Work with agricultural organizations to create an outreach program to inform Yolo farmers about ways to reduce nitrogen fertilizer application with minimal effects on crop yield.	Agricultural Commissioner	By June 2011

PROGRESS INDICATORS		TARGET YEAR
A	Average nitrogen fertilizer application rates reduced by 6% below current (2008) levels.	2020
B	Average nitrogen fertilizer application rates reduced by 15% below current (2008) levels.	2030

MEASURE A-2:
Reduce fossil fuel consumption in field equipment

Measure Description

Farms use a considerable amount of fossil fuel within their field operations. Routine maintenance and more efficient equipment operation can provide valuable fuel savings. Engine and equipment upgrades are also expected to increase fuel efficiency. The County, in association with agricultural organizations, will provide outreach to improve on-farm fuel efficiency.

Ensuring that farm equipment is in top operating condition will save fuel and money, help reduce repair costs, improve equipment reliability, and reduce harmful exhaust emissions. Efficient field operation practices such as optimizing drawbar load can save a substantial amount of fuel. This measure assumes that improvements will reduce fuel consumption in 5% of all field equipment by 6%. This will reduce emissions by 221 MT CO_2e/year in 2020 and by 215 MT CO_2e/year in 2030.

The program will also encourage farmers to upgrade tractors and engines and participate in the Air Resource Board's Carl Moyer program that provides incentive grants for cleaner-than-required engines. These upgrades are anticipated to occur in 25% of tractors by 2020 and 75% of tractors by 2030, resulting in 921 MT CO_2e/year and 2,688 MT CO_2e/year respectively.

2020 GHG Reduction Potential:
1,142 MT CO_2e (<1%)

2030 GHG Reduction Potential:
2,903 MT CO_2e (1%)

Community Co-Benefits:
Save Money
Improve Air Quality

Applicability:
Agricultural Field Equipment

ACTION		RESPONSIBILITY	TIMEFRAME
A	Work with agricultural organizations to provide workshops/presentations and outreach materials focused on promoting fuel efficient farm equipment and operations and encourage participation in the California Air Resources Board's Carl Moyer incentive program.	Agricultural Commissioner	By June 2011

PROGRESS INDICATORS		TARGET YEAR
A	Fuel efficiency improved by 6% in 5% of farm equipment through operation and maintenance improvements.	2030
B	Fuel efficiency improved by 5% in 25% of farm equipment through improvements to equipment (e,g., conversion to Tier IV engines or better).	2020
C	Fuel efficiency improved by 5% in 75% of farm equipment through improvements to equipment (e,g., conversion to Tier IV engines or better).	2030

MEASURE A-3:
Reduce energy use in agricultural irrigation pumping

Measure Description

In Yolo County, diesel, natural gas, and electric irrigation pumps are used to pump groundwater from agricultural wells and to return irrigation tail water for reuse in fields. This measure proposes two programs to reduce irrigation emissions:

Solar Irrigation Return Pumps:
As the cost of photovoltaic panels continues to decline, more farmers are switching to solar-powered irrigation pumps. In Yolo County, farmers tend to use this technology to power tail water-return pumps, which are often lower in horsepower (less than 10 horsepower) and located far from utility connections. Photovoltaic panels are intended to supplement existing power sources, as pumping generally occurs 24-hours a day and solar energy is only available during daylight hours. Grants, financing, and other incentives would likely be needed to make this voluntary program successful. To encourage the expansion of this shift, the County will waive associated permit fees. This measure is expected to reduce agricultural emissions by approximately 16,130 MT CO_2e/year in 2020 and 35,308 MT CO_2e/year in 2030.

Pump Bowl Efficiency:
Routine repairs to pump bowl components can decrease pump energy use by one-third. The County will partner with agricultural organizations to develop an outreach and incentive program to encourage these repairs. The measure is expected to reduce agricultural emissions by approximately 1,331 MT CO_2e/year in 2020 and 1,295 MT CO_2e/year in 2030.

2020 GHG Reduction Potential:
9,396 MT CO_2e (4%)

2030 GHG Reduction Potential:
18,949 MT CO_2e (4%)

Community Co-Benefits:
Improve Air Quality
Reduce Energy Bills

Applicability:
Agricultural Irrigation

ACTION		RESPONSIBILITY	TIMEFRAME
A	Waive County permit fees for projects that convert tailwater-return pumps to solar power.	Planning and Public Works Department	2011
B	Work with agricultural organizations (e.g., Center for Irrigation Technology at CSU Fresno) and Yolo Energy Watch to develop an outreach and incentives program to encourage farmers to improve the efficiency of irrigation pumps.	Agricultural Commissioner	2011

PROGRESS INDICATORS		TARGET YEAR
A	40% of tailwater-return pumps switched to solar electric energy source providing 50% of pumping energy.	2020
B	90% of tailwater- return pumps switched to solar electric energy source providing 50% of pumping energy.	2030
C	10% of groundwater pumps improve pump bowl efficiency for an average 33% reduction in energy (electricity or diesel) consumed.	2020 & 2030

MEASURE A-4:
Reduce confined livestock manure methane emissions

2020 GHG Reduction Potential:
12,370 MT CO_2e (5%)

2030 GHG Reduction Potential:
12,035 MT CO_2e (2%)

Community Co-Benefits:
Improve Air Quality
Improve Water Quality

Applicability:
Existing and New Confined Livestock Operations

Measure Description

Conventional manure management in confined livestock operations (e.g., dairies and feedlots) generates large amounts of methane, a potent greenhouse gas. Installing a biogas control system (BCS) to capture and destroy methane gas from manure treatment reduces GHG emissions and provides the opportunity for renewable electricity generation. A variety of BCS technologies exist including open flaring, electricity generation, and thermal energy production.

According to US Department of Agriculture research, dairy operations generally require a minimum of 300-500 head to produce electricity with a biogas system at a profit. Of the large confined livestock operations in California that have opted to collect biogas, almost all have used the collected biogas to generate electricity and thermal energy for use onsite or to sell to the grid. The installation of a biogas system on the one dairy currently located in the unincorporated area would exceed the greenhouse gas reduction potential of increasing methane capture to 90 percent at the Yolo County Central Landfill. However, due to the high initial cost of installing such systems, only one percent of dairies statewide have biogas collectors. Given the impact of the current recession on the dairy industry in California, significant grant funding and support will be needed to assist the dairy operation, should the operator choose to voluntarily participate in developing a biogas system.

The Climate Action Registry has developed a report titled *Livestock Project Protocol*, which provides guidance to calculate, report, and verify emission reductions associated with installing a BCS. Projects that fulfill protocol requirements are eligible to trade the emissions reductions associated with methane reduction and renewable energy generation on existing carbon markets. Revenues earned from this could help offset BCS development costs. The County will assist operators in identifying funding sources to support BCS development.

ACTION		RESPONSIBILITY	TIMEFRAME
A	Work with confined livestock operators to identify potential funding assistance for the implementation of methane biogas control systems and related renewable energy generation systems.	Agricultural Commissioner	By June 2011

PROGRESS INDICATORS		TARGET YEAR
A	Reduction of 90% manure methane emissions from 100% of confined livestock operations.	2020 & 2030

MEASURE A-5:
Reduce methyl bromide application

Measure Description

Methyl bromide is a pesticide used to treat nematode infestations in stone fruit orchards and strawberry fields, and to treat post-harvest facilities for commodities such as walnuts, grapes, raisins, and cherries. Commodities are often treated with the fumigant as part of a quarantine or import requirements of an importing country. In 2005, over 15,000 pounds of the fumigant were used within the county, resulting in 36 MT CO_2e of GHG emissions.

In accordance with the Montreal Protocol, the U.S. government is in the process of phasing out methyl bromide due to its negative impacts on the ozone layer. The Protocol called for 100% elimination of the pesticide by 2005 except for critical use exemptions. However, the State of California has been granted a critical use exemption for various agricultural uses for every year after 2005. While the State continues to request these exemptions, this measure assumes that use of the pesticide will be eliminated by 2020 when viable alternatives are expected to exist.

2020 GHG Reduction Potential:
36 MT CO_2e (<1%)

2030 GHG Reduction Potential:
36 MT CO_2e (<1%)

Community Co-Benefits:
Improve Air Quality
Improve Water Quality

Applicability:
Orchards and Post-Harvest Processing Facilities

ACTION		RESPONSIBILITY	TIMEFRAME
A	International phase-out expected to eliminate methyl bromide use by 2020.	N/A	2020

PROGRESS INDICATORS		TARGET YEAR
A	100% reduction in methyl bromide application	2020 / 2030

MEASURE A-6:
Sequester carbon in agricultural landscapes

Measure Description

Carbon sequestration refers to the accumulation of atmospheric carbon within the biomass of plants and soils. Agricultural and open space landscapes in Yolo County offer considerable potential for carbon sequestration. While other measures in the CAP focus on reducing GHG emissions, this measure aims to offset the community's emissions through the restoration of riparian forests, establishment of hedgerows, and planting of additional permanent orchards.

Riparian Forest Restoration

Historically, riparian forests existed along most waterways in Yolo County. These forests were cleared to make way for agriculture, cities, and other uses. Today, approximately 2,000 acres in Yolo County could be restored to riparian forest. The U.S. Forest Service's Carbon Online Calculator estimates that a mature riparian forest in California sequesters approximately 112 MT CO_2 per acre. Over a 100-year growth period, the annual sequestration rate can be expected to be approximately 0.46 MT CO_2 per acre per year.

The County will develop a program to allow developers to restore riparian forests to offset all or a portion of the GHG emissions related to a particular development. The forests would be required to be in locations that are found by a qualified biologist to be either consistent with or complementary to the Yolo Natural Heritage Program, and protected in perpetuity through conservation easements. It is estimated that this program and other sources will enable 1,100 acres to be restored by 2020, and 2,000 acres to be restored by 2030. This level of reforestation is expected to provide a reduction of 2,203 MT CO_2e/year and 4,006 MT CO_2e/year respectively.

On-Farm Conservation Practices

Since the mid-1990's, the Yolo County Resource Conservation District (RCD), in cooperation with the United States Department of Agriculture's (USDA) Natural Resource Conservation Service (NRCS), has helped farmers develop hedgerows, enhance sloughs, vegetate drainage ditches, and establish filter strips to create habitat for beneficial insect species, improve crop pollination, improve water quality, and reduce soil erosion. (See the RCD list of practices at http://www.yolorcd.org/nodes/resource/landowner_practices.htm).

Hedgerows consist of linear strips of native grasses, shrubs, and trees planted on field edges. RCD estimates that they establish 5 miles (or 7.6 acres) of new hedgerows annually throughout the county. Slough enhancement, consisting of vegetated drainage ditches and filter strips, are similar in many respects to hedgerows. It involves the planting of deep-rooted native grasses, sedges and rushes, trees, shrubs, and forbs along the edge of sloughs, ditches, and fields.

A recent UC Davis study of the carbon sequestration potential of agricultural landscapes found that a 15-year old hedgerow sequesters approximately 8 MT CO_2 per acre. This equates to a rate of 0.51 MT CO_2 per acre per year. It is expected that on-farm conservation practices, given that they employ the same plant palates, would provide similar sequestration rates.

Between 2011 and 2020, RCD's program is expected to establish 175 acres of hedgerow sequestering 324 MT CO_2/year. By 2030, a total of 380 acres will be established, sequestering 704 MT CO_2/year. The County will create a program that would allow developers to pay fees to have RCD establish additional conservation practices, depending on the location and landowner interest. This mix of practices could be used to offset all or a portion of the development's emissions.

Permanent Crops
According to the County Agricultural Commissioner, Yolo County is experiencing a trend away from annual field crops and toward permanent crops (e.g., orchards). The County Annual Crop Reports show that orchards and vineyards accounted for 19,528 acres in 1990. By 2008, that number had nearly doubled to 36,008 acres. For this measure, the County assumes that this trend will continue. The CAP assumes that an increase of 1,146 acres of almonds, 891 acres of walnuts, and 2,860 acres of olives will occur over the next 20 years.

It is estimated that these trees will sequester 17,600 MT CO2/year in 2020 and 55,568 MT CO2/year in 2030. At the time of plan preparation, no carbon sequestration protocol exists for permanent crops. As a result, the estimates are not credited toward the 2020 emissions reduction target.

Crop Roots
As with permanent crops, there is no accepted protocol that would currently allow the CAP to apply sequestration credits from crop roots transferring carbon from the atmosphere into sub surface soil toward the 2020 target.

As the science develops and accepted protocols include carbon storage in permanent crops and crop roots, the County expects this type of sequestration to be applied toward future targets. As a result, permanent crops are credited toward the 2030 reduction goal.

Oak Woodlands
Existing oak trees are already accounted for in the 2008 GHG inventory. The preservation of existing oak trees does not create any additional emission reductions; it only maintains the current baseline condition. As a result, any permanent easements to protect existing oak trees would double-count the level of carbon sequestration that already exists. However, if a land owner were to plant and maintain new oak trees, they would create additional savings in greenhouse gas emissions that could receive carbon credits.

Carbon Sequestration Considerations
How long carbon will be stored in a landscape is a key consideration. Unlike most other reductions in GHG emissions, which once achieved become permanent, carbon sequestration benefits can be reversed at any point in the future. For example, forests or orchards can be cut down and removed. The County will work to ensure that the issue of permanence is addressed within proposed sequestration programs and when monitoring CAP effectiveness.

2020 GHG Reduction Potential:
2,527 MT CO_2e (1%)
(does not include permanent crops)

2030 GHG Reduction Potential:
60,033 MT CO_2e (12%)
(includes permanent crops)

Community Co-Benefits:
Restore Habitat
Improve Water Quality

Applicability:
Agriculture, Open Space
New Development

ACTION		RESPONSIBILITY	TIMEFRAME
A	Create a program to allow developers to restore riparian forest and/or oak woodlands in locations consistent with or that complement the Yolo Natural Heritage Program to offset all or a portion of the development's expected emissions.	Agricultural Commissioner, Planning and Public Works	By June 2011
B	Create a program to allow developers to pay fees that would assist the Resource Conservation District (RCD) to implement its on-farm conservation practices program. The net GHG savings from such projects would be used to offset all or a portion of the development's expected emissions.	Agricultural Commissioner, Planning and Public Works	By June 2011
C	Develop a system for tracking the establishment of new orchards in the County, using the GIS data provided by the Agricultural Commissioner.	Agricultural Commissioner, Planning and Public Works	By June 2011

PROGRESS INDICATORS		TARGET YEAR
A	1,100 acres of riparian forest restored by 2020. 2,000 acres restored by 2030.	2020 / 2030
B	50 miles of new hedgerow established by 2020 and 100 miles established by 2030.	2020 / 2030
C	New orchards established by 2020 (537 acres almonds, 446 acres walnuts, 1,340 acres olives). New orchards established by 2030 (1,146 acres almonds, 891 acres walnuts, 2,860 acres olives).	2020 2030

Supporting Measures for Agriculture

The County also considered the following supporting measures as part of the Agriculture Strategy. The County will continue to monitor the feasibility of these measures, and may employ one or more of these measures to achieve the 2030 GHG reduction goal.

Increase Use of Biofuels or Low-Carbon Fuels in Field Equipment

Replacing conventional gasoline and diesel with biofuels (e.g., biodiesel, ethanol) or low-carbon fossil fuel alternatives, has the potential to reduce GHG emissions associated with field equipment operation.

California's Low Carbon Fuel Standard law requires changes to the types of fuels used in vehicles. While the legislation's primary focus is automobiles and trucks, future changes to fossil fuel composition and a greater availability of biofuels will help reduce field equipment emissions as well.

The County will promote the use of such fuels through the support of biofuel co-operatives and by working with current agricultural fuel suppliers to increase the availability of biofuels in the region.

While the use of biofuels may provide GHG reductions benefits it is important to consider the lifecycle effects associated with each fuel type. A recent Air Resource Board study found that the manufacture of corn-based ethanol produces twice the GHG emissions of gasoline for every mile driven (ARB 2009). Additionally, the County will not support the use of biofuels that create secondary impacts such as rainforest habitat destruction or global food price increases.

Conservation Tillage

In conservation tillage systems, crops are grown with minimal cultivation of the soil. This practice can result in less fuel use. According to the National Sustainable Agriculture Information Service, no-till methods can cut tractor use by half, and reduce fuel costs by as much as $10 per acre compared to traditional tillage.

In traditional tillage systems, a farmer will plow, disk, and cultivate before and after planting. Conservation tillage minimizes these operations by either eliminating seedbed preparation, or by combining it with other field operations like planting. Potential trade-offs include a possible increase in the amount of herbicides and fertilizer.

An additional benefit of conservation tillage is that it results in increased soil carbon storage. Farmland converted from traditional tillage to conservation tillage could aid the county's carbon sequestration efforts. Research indicates that conservation tillage can, however, result in increased nitrous oxide emissions because minimally tilled soils have lower levels of soil aeration and higher de-nitrification rates than conventionally tilled soils (Rochette 2008). These increased N_2O emissions may be large enough to cancel out the carbon storage benefits.

Regardless of whether conservation tillage benefits climate change, market forces are already resulting in greater use of these practices. Over the past several years, as the popularity of organic and "green"

products has grown among consumers, retail companies and other large buyers of farm produce have increasingly required growers to carry out sustainable farm practices, such as conservation tillage. The retailers are then able to incorporate growers' practices into the advertising of the products.
The County will continue to evaluate conservation tillage as a potential source of GHG reductions.

Reduce Methane Emissions from Manure Management in Horse Facilities

Livestock biogas control systems (BCS) are primarily used in dairies and cattle feedlots. Similar systems could be applied to stables to reduce horse manure methane emissions. The County will explore the technical and economic feasibility of utilizing BCS in this manner in future updates to the CAP.

Increase Consumption and Production of Local Agricultural Products

Increasing the consumption and production of local agricultural products improves the local economy and can reduce food-related GHG emissions. Yolo County farms and ranches produce a tremendous variety of products. While many residents, restaurants, and institutions have access to these products through existing markets, the County would like to further facilitate this consumption by establishing local product marketing efforts, expanding the number of businesses and agencies that use local food, and increasing opportunities for the direct sale of local food.

In addition, local production of agricultural products can also reduce the emissions associated with transport. In recent years, a tomato seedling company has relocated from the Stockton area to Yolo County, significantly shortening the distance they would have otherwise been hauled to local fields for planning. Similarly, the Bogle Winery currently under construction will greatly expand the capacity of local processing facilities, eliminating the need to send grapes to Lodi for crushing, as well as the return trip to bring the juice back to the winery for fermentation. Another example is a proposed olive mill located in the Capay Valley, which will avoid truck trips to Corning for processing.

In both cases, the County will work with established agricultural organizations to expand "Buy Local" campaigns that target households, businesses, and civic groups in Yolo County; and to find locations and/or provide financing to address infrastructure needs. The County will also work with farmers' market associations to identify potential locations for new markets, and/or expansion of existing markets, as well as to facilitate permitting for new processing facilities.

Reduce Agricultural Water Use Through Alternative Irrigation Techniques

As discussed in Measure A-3, pumping groundwater for irrigation generates GHG emissions. Increasing the efficiency of the amount of water used in groundwater-irrigated farmland through application of alternate-furrow, drip, and deficit irrigation could reduce these emissions.

Applications of alternate-furrow and drip irrigation in Yolo County have successfully improved yields in a variety of crops without using more water. However, drip irrigation can require additional pressurization and plastic drip tape. These factors should be considered when evaluating GHG reduction potential.

Deficit irrigation optimizes water application by irrigating crops during their drought-sensitive growth stages and limiting water during other stages. In addition to reducing water consumption, the strategy can improve fruit quality and control of disease and pests.

With UC Extension, the Flood Control and Water Conservation District, Reclamation Districts, water districts, and farming organizations, the County will develop an outreach program that encourages adoption of irrigation best practices including these three strategies.

Recent research indicates that alternate-furrow, drip irrigation, and deficit irrigation can increase soil aeration and reduce nitrous oxide emissions. As this research evolves, the County will consult with extensions and UC Davis researchers to evaluate potential ways to quantify the associated GHG reduction benefits.

Expand Surface Irrigation Infrastructure

Another way to reduce groundwater pumping-related emissions is to expand surface irrigation to additional acreage in County. Groundwater is used almost exclusively in areas of the County not served by irrigation canals. The County will work with the Flood Management and Water District to examine the potential to expand the acreage served by surface irrigation storage and/or infrastructure.

Expand Use of Bioengineered Crops

Engineered crops have the potential to significantly reduce agricultural GHG emissions. For instance, the use of crops developed to be resistant to glyphosphate has greatly decreased both the amount of tillage and nitrogen fertilizer applied. They also require less spraying than conventional varieties, which reduces the emissions associated with farm equipment. If this trait can be incorporated more

broadly, it would further reduce the use of nitrogen fertilizer.

Yolo County is currently home to a large concentration of bioengineering firms and will continue to work with the industry to facilitate the establishment and expansion of their operations.


Lorrie Jo Williams