Chapter 6
Agriculture

Photo: Marin Community Development Agency

Chapter 6
Agriculture

6.1 Introduction

Agriculture is an important part of Marin County's economy, identity, and heritage. The County is already ahead of the curve on sustainable agricultural practices. Marin's livestock farms and ranches are pasture-based and grass-fed operations, with documented reductions in emissions relative to other systems (O'Brien et al. 2014). The Marin Carbon Project, as discussed below, has been at the forefront of working with ranchers and dairies in Marin County to promote carbon farming practices and expand soil carbon sequestration and other practices to reduce GHG emissions.

Agriculture is discussed separately from other community and municipal emission reductions strategies because the agricultural economy is different from other emission sectors, such as residential, commercial, industrial and municipal development, and transportation. More important, the opportunities for long-term GHG reductions for the agricultural sector are fundamentally different from those in other sectors in that they are primarily focused not on reducing GHG emissions per se but in increasing sequestration of carbon from the atmosphere through farming practices and other practices on working range lands to improve the fertility and long-term ecological health of the county's agricultural lands. These "carbon farming" practices have the potential, in time, to contribute to large reductions in net GHG emissions in Marin County and, if scaled up, larger landscapes across California and elsewhere. In that context, the demonstrated success of what is being pioneered in Marin County may be critical to the ability of California and the country as a whole to achieve long-term GHG reduction goals long beyond 2020.

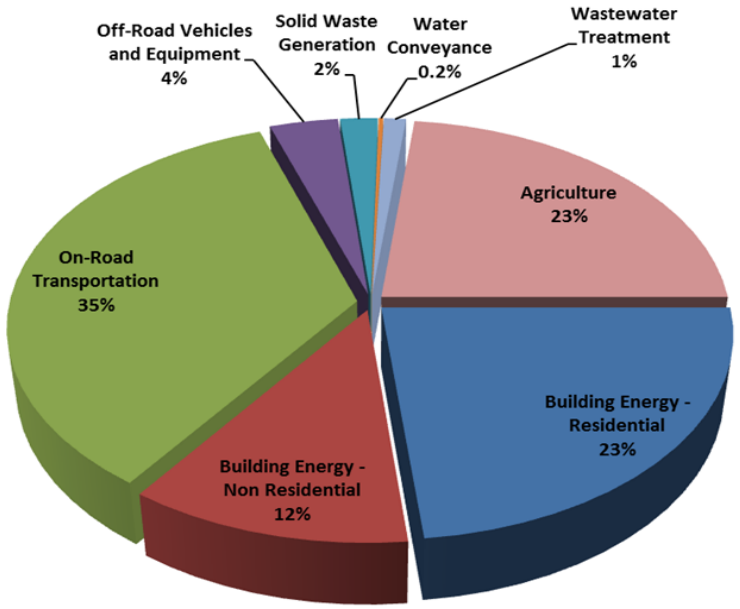
6.2 Agricultural Greenhouse Gas Emissions and Carbon Sequestration

6.2.1 Agricultural GHG Emissions

Emissions from agriculture that were quantified as part of this Climate Action Plan are primarily from manure management and enteric fermentation of livestock but also include fugitive emissions of nitrous oxide from fertilizer application.

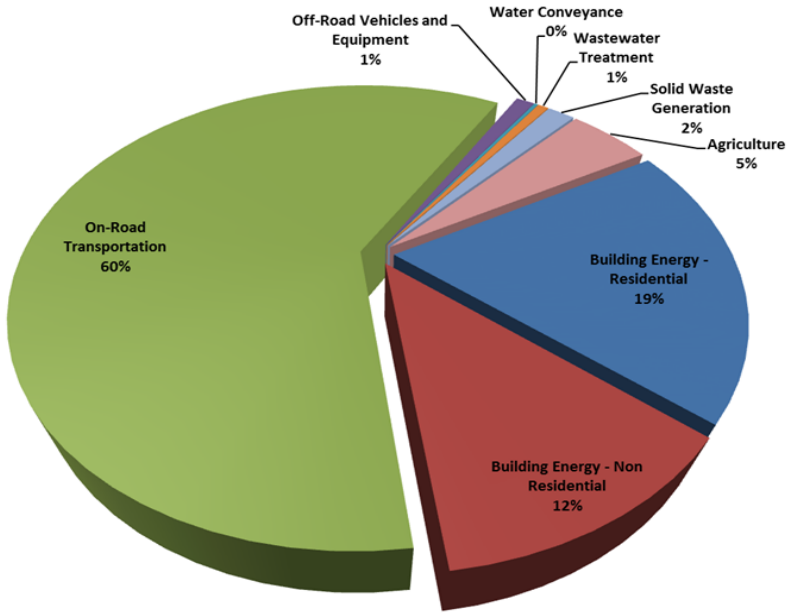
Although emissions from agriculture in the unincorporated county area (110,000 $MTCO_2e$) made up 23% of GHG emissions in the unincorporated county in 2012, this does not portray the proper context because the county has a disproportionate amount of agricultural land and activity; the incorporated cities have very limited agricultural activity. Although governmental jurisdictional boundaries separate the county into incorporated cities and the unincorporated county, from an economic point of view, the jurisdictional boundaries are artificial. The agricultural economy is not separate from the rest of the county, including the incorporated cities. When comparing the amount of agricultural emissions with countywide emissions, including the cities and the unincorporated area, agricultural emissions would constitute only approximately 5% of the total GHG emissions.

Figure 6-1. Comparative Agricultural Share of Overall GHG Emissions



Unincorporated County Only (2012)

Total emissions = 477,456 $MTCO_2e$



Countywide (2010)

Total emissions = 2.3 million $MTCO_2e$

Agricultural GHG Emissions in Context

Agricultural areas are located predominantly in the unincorporated area of Marin County and make up nearly quarter (23%) of the unincorporated area's annual emissions. However, when compared with larger geographies, the role of agricultural emissions is much smaller:

- Agricultural emissions (110,000 $MTCO_2e$) were approximately 5% of Marin's countywide 2010 emissions (2.3 million $MTCO_2e$).
- California's 2012 GHG emissions were approximately 459 million $MTCO_2$, of which agricultural emissions were approximately 38 million $MTCO_2e$, or 8%.

6.2.2 Agricultural Carbon Stocks and Sequestration

Unlike many other emissions sectors, carbon stock and sequestration are key considerations when examining the GHG inventory for the agricultural sector. As noted above in Chapter 3, *Updated Emissions Inventories and Forecast*, the current protocols (such as the 2012 ICLEI Protocol) for local GHG inventories recommends that inventories of carbon in agricultural and forestlands be separated from inventories of other man-made sources of GHG emissions because such carbon stock is part of the cycling of carbon from the atmosphere. However, the amount of carbon stock in agricultural soils and aboveground vegetation in working farms and rangelands is directly related to the agricultural and range management practices that have been historically used and are in use today. A baseline of current carbon stocks can be used to track changes in the amount of carbon stocks over time due to changes in farming and rangeland management. Where agricultural and silviculture practices result in net sequestration of carbon from the atmosphere and increase carbon stocks over baseline levels, this represents a net reduction in GHG emissions.

As described in Appendix B, *Inventory and Forecast Details*, calculating carbon stocks and annual sequestration in agricultural soils and vegetation is often difficult to do accurately because of the lack of comprehensive soil and vegetation data. The amount of soil carbon and vegetative carbon stock can vary substantially for different soils and vegetation from one location to another and can also vary for the same type of soil and the same type of vegetation, depending on belowground organic matter content and vegetation density and extent. Thus, the majority of calculations were performed by using regional estimates of sequestration potentials and carbon stock values that are only approximate. As described below, improving the baseline accounting of current carbon stock and sequestration within Marin County agricultural and natural lands is a recommended action measure in this plan.

As presented in Chapter 3, *Updated Emissions Inventories and Forecast*, rangeland soil carbon stocks in 2012 on the 148,000 acres of rangeland in Marin County were estimated as 10.78 million MT of carbon, which is the equivalent of 39.5 million $MTCO_2e$. Without multiple years of carbon stock inventories, the amount of annual sequestration in rangeland and other land covers was not estimated. However, as discussed below, a 1% increase in the amount of carbon stock in Marin County rangelands by 2030 would result in an annualized amount of emissions reduction that would exceed all of the other local measures included in this plan if realized.

The remainder of this chapter discusses the reduction strategies in the agricultural sector that are currently under way and that have potential to contribute substantially to future GHG reductions through increased carbon sequestration and other measures.

6.3 Greenhouse Gas Reduction Measures

The County has identified a number of new strategies to address emissions from agriculture, which are described below.

This CAP recognizes the significant potential agriculture has with respect to its contributions to climate change mitigation and resilience through the implementation of new strategies and supports the recognition of such practices as offsets for CEQA compliance under County, BAAQMD, and statewide authorities. The County supports the efforts of Marin farmers to implement on-farm

practices that help to address GHG emissions, consistent with County policies found in the Countywide Plan and other County directives. This program is supported by a number of Marin Countywide Plan policies.

The County also supports voluntary best management practices for agriculture. This may include adding compost from local community waste to the soil, using no-till and reduced-till practices, using organic fertilizers, reducing fossil fuel use in agricultural equipment, using cover crops in vineyards, using biochar in soils, planting hedgerows, and conserving or restoring natural vegetation, including stream restoration.

6.3.1 Agriculture-1: Methane Capture and Energy Generation at Dairies

This strategy attempts to reduce direct emissions from dairies. This measure is a voluntary measure that encourages the installation of methane digesters to capture methane emissions from the decomposition of dairy manure. The methane could be used on-site as an alternative to natural gas in combustion, for power production, or as a transportation fuel. Using captured biogas could offset natural gas use or off-road fuel use in the county (reductions may be achieved in the building energy sector and/or the off-road sector). Further, individual project proponents can sell GHG credits associated with these installations on the voluntary carbon market.[27]

As a voluntary measure, the County would support dairies that consider existing and new technologies to control emissions from enteric fermentation and manure management and assess the feasibility and cost effectiveness of these technologies. Dairies would be encouraged to explore new technologies and implement feasible and cost-effective manure digestion projects based on their own local conditions and operations. The County would assist in seeking local, regional, state, and/or federal grants to help offset capital costs, linking dairies to new research opportunities, and work with local partners to help assess the feasibility of reduction projects and cost-effective options where available. The County, along with Marin Clean Energy, will also explore the potential for MCE to use electricity from local methane digesters as part of its energy portfolio.

Centralized digester systems are designed to gain economies in digester operation by using the manure from a cluster of dairy farms (Lee and Sumner 2014), but new and emerging biogas recovery technologies suggest this approach may be applicable even to Marin's smaller dairy operations (Greer 2010). To be economically feasible, digesters in California must be designed per regulatory constraints, maximize operational efficiency through the use of recovered heat and co-digestion where possible, capture all potential revenue streams, and secure power purchase agreements or offset their own energy use at favorable prices (Lee and Sumner 2014). Achieving these conditions is extremely challenging but could be made less so by the active engagement of County regulatory agencies that support such projects and the use of Marin dairy digester projects for CEQA mitigation at a CO_2e value that is high enough to render projects economically viable.

[27] Individual project proponents could also sell GHG credits associated with these installations on the voluntary carbon market to offset GHG emissions due to other activities. To the extent that project proponents sell GHG offset credits, these same credits may not be applied to local GHG emission reductions. Thus, even though there might be reductions in local emissions, there would be no net reduction in emissions globally. Nevertheless, carbon markets offer opportunities for agriculture to provide offsets and be financially compensated for doing so, including the sale of offsets that could be credited to local GHG reduction and then be retired rather than being sold as offsets for other projects.

6.3.2 Agriculture-2: Carbon Farming

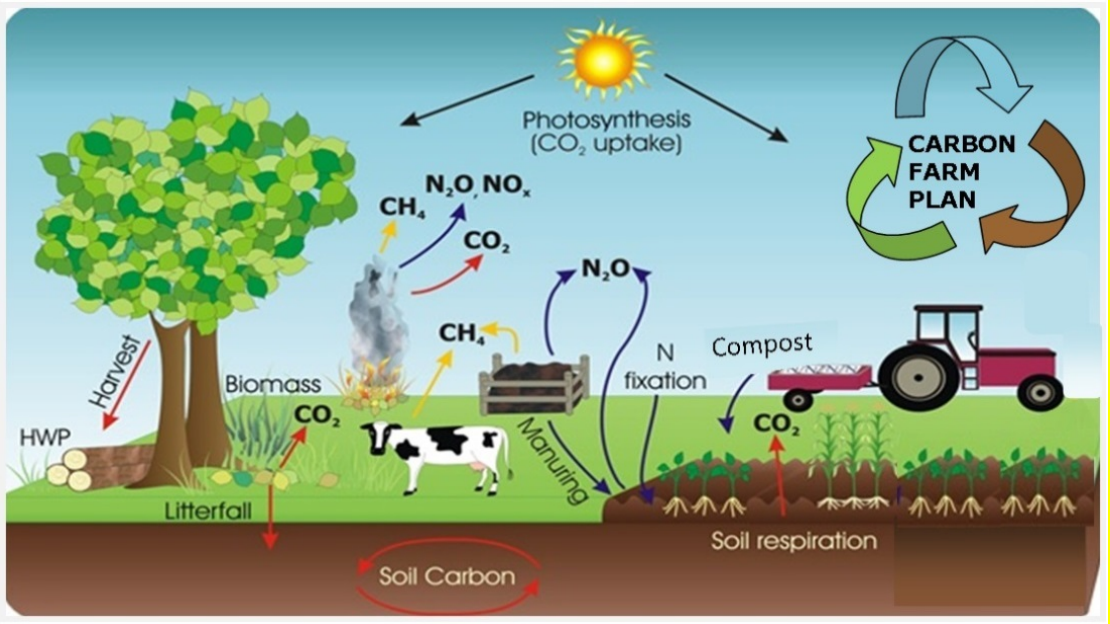
This measure includes voluntary actions by Marin's farmers and ranchers to increase carbon sequestration in farmed and ranched lands in the county. Such actions are supported by non-profit organizations such as the Marin Carbon Project (MCP), University of California Cooperative Extension (UCCE), the Natural Resources Conservation Service (NRCS), Marin Resource Conservation District (RCD), academic researchers, other organizations (e.g., the Carbon Cycle Institute), and Marin County, as described below.

6.3.2.1 Carbon Farming Methods and Reduction Potential

The Marin Carbon Project is a consortium of the leading agricultural institutions and producers in Marin County, university researchers, county and federal agencies, and nonprofit organizations that seek to understand and demonstrate the potential of enhanced carbon sequestration in Marin's agricultural and rangeland ecosystems (MCP 2013). MCP seeks to enhance carbon sequestration in rangeland, agricultural areas, and forest soils through applied research, demonstration, and implementation. For example, compost application, just one of numerous identified climate beneficial practices that are currently being implemented, has the potential to provide significant GHG emission reductions through additional carbon sequestration. A one-time application of 0.5 inch of compost on Marin's rangeland can produce an additional carbon sequestration rate of 1 $MTCO_2e$ per hectare per year, or 0.3 $MTC0_2e$ per acre per year (Ryals and Silver 2013).

The MCP demonstrates and promotes the concept of *carbon farming* through an integrated planning and implementation process that includes agricultural practices that are known to improve the rate at which CO_2 is removed from the atmosphere and converted to plant material and/or soil organic matter. Carbon farming is successful when carbon gains exceed carbon losses. Figure 6-2 illustrates the carbon farming concept.

Figure 6-2. Carbon Farming



Source: Intergovernmental Panel on Climate Change through the Marin Carbon Project, 2013.

Table 6-1 describes the practices that the NRCS has approved for improving organic matter (aka "soil carbon") in agricultural and rangeland soils. As described below, these measures not only would increase soil carbon but also have a wide range of other environmental benefits, including reducing erosion, preventing compaction, managing nutrients, conserving water, improving water quality, managing plant pests (weeds, insects, diseases), providing food for domestic livestock, and providing food and cover for wildlife, among other benefits. The Marin RCD, which has been active for many years, has supported sustainable agricultural systems. It has also supported the implementation of many of these measures in Marin County.

Table 6-1. Approved Natural Resource Conservation Service Practices for Improved Organic Matter

Practice	NRCS Code	Description/Benefits
Conservation Crop Rotation	328	Growing crops in a recurring sequence on the same field. BENEFITS: Reduce sheet and rill erosion, reduce irrigation induced erosion, reduce soil erosion from wind, maintain or improve soil organic matter content, manage deficient or excess plant nutrients, improve water use efficiency, manage saline seeps, manage plant pests (weeds, insects, diseases), provide food for domestic livestock, and provide food and cover for wildlife.
Cover Crop	340	Grasses, legumes, forbs, or other herbaceous plants established for seasonal cover and conservation purposes. BENEFITS: Reduce erosion from wind and water, increase soil organic matter, manage excess nutrients in the soil profile, promote biological nitrogen fixation, increase biodiversity, provide weed suppression, provide supplemental forage, and manage soil moisture.
Access Control	472	The temporary or permanent exclusion of animals, people, vehicles, and/or equipment from an area. BENEFITS: Achieve and maintain desired resource conditions by monitoring and managing the intensity of use by animals, people, vehicles, and/or equipment in coordination with the application of the schedule of practices, measures, and activities specified in the conservation plan.
Conservation Cover	327	Establishing and maintaining permanent vegetative cover to protect soil and water resources. BENEFITS: Reduce soil erosion and sedimentation, improve water quality, and enhance wildlife habitat.
Critical Area Planting	342	Planting vegetation, such as trees, shrubs, vines grasses, or legumes, on highly erodible or critically eroding areas (does not include tree planting mainly for wood products). BENEFITS: To stabilize the soil, reduce damage from sediment and runoff to downstream areas, and improve wildlife habitat and visual resources.
Field Border	386	A strip of permanent vegetation established at the edge or around the perimeter of a field. PURPOSE: Reduce erosion from wind and water, protect soil and water quality, manage harmful insect populations, provide wildlife food and cover, increase carbon storage in biomass and soils, and improve air quality.
Filter Strip	393	A strip or area of vegetation for removing sediment, organic matter, and other pollutants from runoff and wastewater. This standard establishes the minimally acceptable requirements for design and operation and maintenance of filter strips for removing sediment, organic matter, and other pollutants from runoff or wastewater. BENEFITS: To remove sediment and other pollutants from runoff or wastewater by filtration, deposition, infiltration, absorption, adsorption, decomposition, and volatilization, thereby reducing pollution and protecting the environment.
Grassed Waterway	412	A natural or constructed channel that is shaped or graded to required dimensions and established in suitable vegetation for the stable conveyance of runoff. This standard applies to natural or constructed channels that are to be established in vegetation and used for water disposal. Grassed waterways with stone centers are also included. BENEFITS: To covey runoff from terraces, diversions, or other water concentrations without causing erosion or flooding and improve water quality.
Hedgerow Planting	422	Establishment of dense vegetation in a linear design to achieve a natural resource conservation purpose. BENEFITS: Food, cover, and corridors for terrestrial wildlife; food and cover for aquatic organisms that live in watercourses with full bank widths of less than 5 feet; living fences, boundary delineations, contour guidelines, screens, and barriers to noise, odors, and dust; and improvement of landscape appearance.
Mulching	484	Applying plant residues or other suitable materials to the soil surface. BENEFITS: To conserve moisture, prevent surface compaction or crusting, reduce runoff and erosion, modify surface temperatures, control weeds, help establish plant cover, and reduce particulate matter emissions into the air.

Practice	NRCS Code	Description/Benefits
Nutrient Management	590	Managing the amount, source, placement, form, and timing of the application of nutrients and soil amendments. BENEFITS: To budget and supply nutrients for plant production; properly use manure or organic by-products as a plant nutrient source; minimize agricultural nonpoint-source pollution of surface and groundwater resources; and maintain or improve the physical, chemical, and biological condition of soil.
Pasture and Hay Planting	512	Establishing native or introduced forage species. BENEFITS: Establish adapted and compatible species, varieties, or cultivars; improve or maintain livestock nutrition and/or health; extend the length of the grazing season; provide emergency forage production; and reduce soil erosion by wind and/or water.
Prescribed Grazing	528	The controlled harvest of vegetation with grazing or browsing animals, managed with the intent of achieving a specified objective. BENEFITS: Improve or maintain the health and vigor of selected plant(s) and maintain a stable and desired plant community; provide or maintain food, cover, and shelter for animals of concern; improve or maintain animal health and productivity; maintain or improve water quality and quantity; reduce accelerated soil erosion and maintain or improve soil conditions for the sustainability of the resource; and promote economic stability through grazing land sustainability.
Range Planting	550	Establishment of adapted perennial vegetation such as grasses, forbs, legumes, shrubs, and trees. BENEFITS: Restore a plant community similar to its historic climax or the desired plant community, provide or improve forages for livestock and/or browse or cover for wildlife, reduce erosion by wind and/ or water, improve water quality and quantity, and increase carbon sequestration.
Residue Management – Seasonal	344	Managing the amount, orientation, and distribution of crop and other plant residues on the soil surface during part of the year, while growing crops in a clean tilled seedbed. BENEFITS: Reduce sheet and rill erosion, reduce soil erosion from wind, and provide food and escape cover for wildlife. Allow timely cycling of high volumes of residue, and maintain or improve soil organic matter content and tilth.
Residue Management – Mulch Till	344	Managing the amount, orientation, and distribution of crop and other plant residue on the soil surface year-round while growing crops where the entire field surface is tilled prior to planting. BENEFITS: Reduce sheet and rill erosion, reduce wind erosion, maintain or improve soil organic matter content and tilth, conserve soil moisture, and provide food and escape cover for wildlife.
Riparian Forest Buffer	391	An area of predominantly trees and/or shrubs located adjacent to and up-gradient from watercourses or water bodies. BENEFITS: Create shade to lower water temperatures and improve habitat for fish and other aquatic organisms; provide a source of detritus and large woody debris for fish and other aquatic organisms as well as riparian habitat and corridors for wildlife; reduce excess amounts of sediment, organic materials, nutrients, pesticides, and other pollutants in surface runoff; reduce excess nutrients and other chemicals in shallow groundwater flow; provide protection against scour erosion within the floodplain; restore natural riparian plant communities; moderate winter temperatures to reduce freezing of aquatic over-wintering habitats; and increase carbon storage.
Riparian Herbaceous Cover	390	Riparian areas are ecosystems that occur along watercourses or at the fringe of water bodies. Riparian herbaceous cover consists of grasses, grasslike plants, and forbs. PURPOSE: Riparian areas provide habitat (food, shelter, and water) for aquatic and terrestrial organisms; intercept direct solar radiation, create shade, and increase the depth-to-width ratio to help maintain or restore suitable water temperatures for fish and other aquatic organisms while providing a milder microclimate for wildlife; improve and protect water quality by reducing the amount of sediment and other pollutants, such as pesticides, organic materials, and nutrients in surface runoff as well as nutrients and chemicals in shallow groundwater flow; provide food, in the form of plant detritus, for aquatic insects, which are important food items for fish; help stabilize the channel bed and streambank; serve as corridors to provide landscape linkages between existing habitats; provide room for watercourses to establish geomorphic stability; and manage existing riparian herbaceous habitat to improve or maintain desired plant communities.

Practice	NRCS Code	Description/Benefits
Tree and Shrub Establishment	612	Establishing woody plants by planting seedlings or cuttings, direct seeding, or natural regeneration. BENEFITS: Establish woody plants for forest products, provide erosion control, enhance energy conservation, reduce air pollution by uptake of soil- and water-borne chemicals and nutrients, beautify an area, protect a watershed, provide wildlife habitat, treat waste, sequester carbon, and increase species diversity.
Vegetation Treatment Area	635	An area of permanent vegetation used for agricultural wastewater treatment. BENEFITS: Improve water quality by reducing loading of nutrients, organics, pathogens, and other contaminants associated with livestock, poultry, and other agricultural operations.
Windbreak/ Shelterbelt	380	Linear plantings of single or multiple rows of trees or shrubs established for environmental benefits. BENEFITS: Reduce wind erosion, protect growing plants, provide shelter for structures and livestock, provide wildlife habitat, provide a tree or shrub product, provide living screens, improve aesthetics, improve irrigation efficiency.

The MCP launched a demonstration carbon farm program in the county, starting on three farms, and is securing the policy and economic support necessary for the adoption of carbon-beneficial practices at scale in Marin County. The farms have already applied nearly 4,000 cubic yards of compost to their rangelands and are working to complete the carbon farm planning process. Each of the demonstration farms is presently developing a comprehensive Carbon Farm Plan; these plans will include known climate-resilience and carbon-beneficial practices such as those shown in Table 6-2, including windbreaks, riparian and range management improvements, and grass, plant, and tree establishment. Figure 6-3 shows an example of a draft carbon farm plan that the MCP has been developing for local farmers. The three farms could reduce GHG emissions by approximately 1,000 $MTCO_2e$ per year if their draft carbon farm plans are implemented.

Figure 6-3. Example Draft Carbon Farm Plan

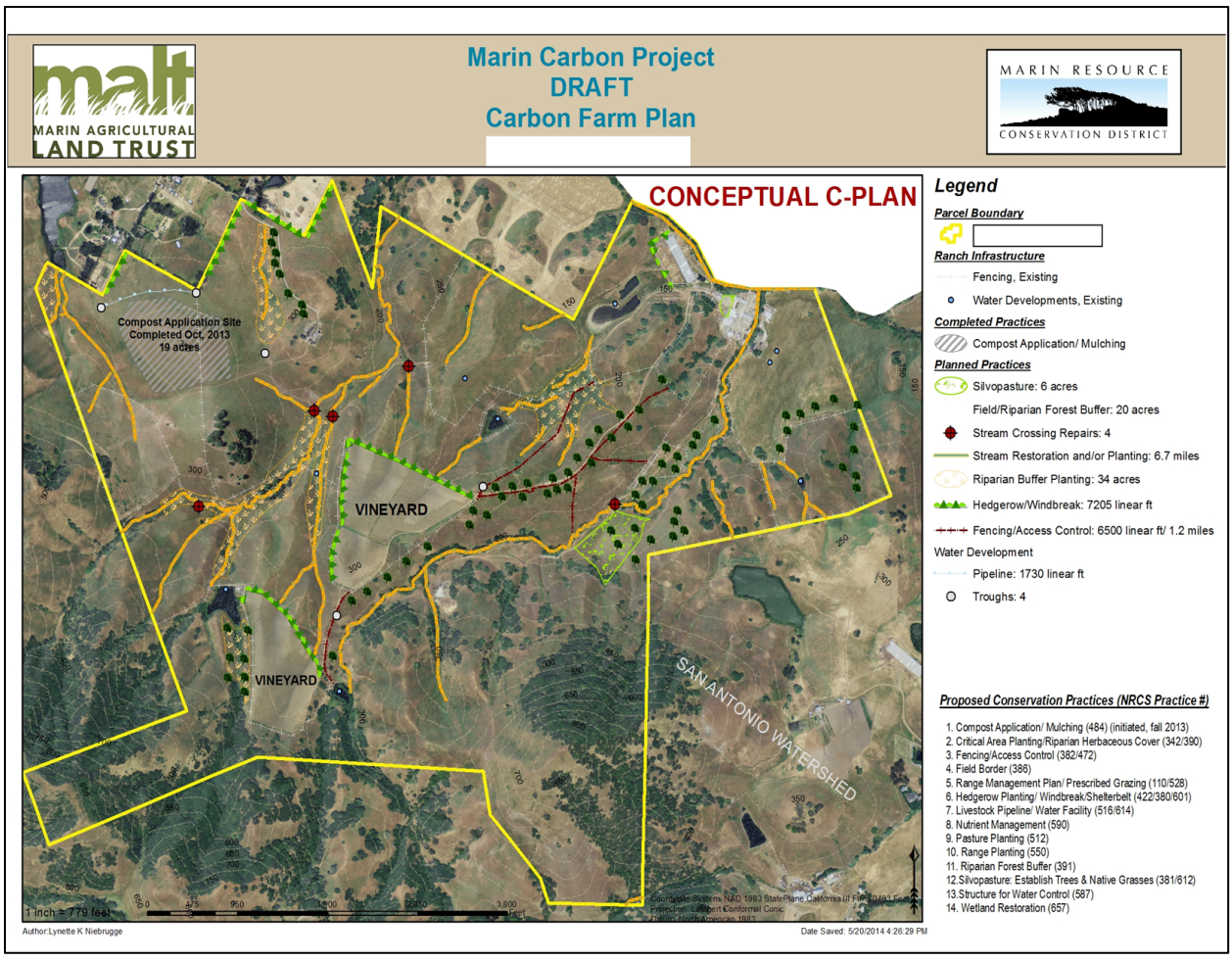


Table 6-2. GHG Reduction Potential of Carbon Farming on Three Marin County Farms ($MTCO_2e$)

Carbon Farming Practice	NRCS Code	Farm A		Farm B		Farm C	
		Annual	20 Year	Annual	20 Year	Annual	20 Year
Pasture Seeding	512			44	880	44	880
Pasture Planting	512					44	880
Windbreaks	380	4	73	17	347	11	213
Prescribed Grazing	528	56	1,120	42	840	42	840
Rangeland Compost	777	88	1,760	88	1,760	88	1,760
Silvopasture	381	49	991	18	357		
Riparian Restoration	391	77	1.555	37	739	10	197
Range Planting	550	44	880				
Riparian Herbaceous Cover	390	36	720			8	160
No Till	329	25	490				
Critical Area Planting	386	19	374			2	44
Field Border	386	12	991				
Nutrient Management	590					57	1,133
Total	NA	408	8,203	266	4,923	315	6,107

Source: Marin Carbon Project.

Notes: Estimates based on draft carbon farm plans for three farms in Marin County. Anaerobic digester measure excluded from this table because this measure is discussed separately in measure Agriculture-1, above.

The MCP is exploring the opportunity for agriculture to receive carbon offset credits through California cap-and-trade or other carbon markets for on-farm climate beneficial practice implementation in Marin. The MCP market protocol for compost application to grazed grasslands, for example, has been approved by the American Carbon Registry, effective October 2014, and CAPCOA in December 2014. It is also under review by BAAQMD as a local GHG credit. As described above, there are numerous other agricultural practices that are broadly recognized as GHG beneficial. These are also available and already often employed by Marin County farmers and ranchers. The GHG benefits of these practices can be quantified through the use of models, such as NRCS COMET-Farm or the less-complex Tier 1 practice-based methods, as shown by the preliminary estimates in Table 6-2.

The Potential Landscape Value of Soil Carbon Farming

Although the exact feasible extent of increases in soil carbon within Marin County may be uncertain, the following give an idea of the potential landscape value of improvements in agricultural soil and rangeland management in Marin County and California if soil carbon farming were to become more widespread. Using estimates from Delonge and Ryals (2013) that show that soil amendments that use composted manure and plant waste could result in GHG reductions over 3 years of approximately 9 $MTCO_2e$ per acre, potential landscape reductions were estimated as follows:

- If soil amendments were applied to 5% of rangeland in Marin County, this would represent an equivalent GHG emissions reduction of 73,000 $MTCO_2e$ over 3 years. Averaged annually, this would represent approximately 23,000 MT of $C0_2e$, which is equivalent to approximately 74% of the quantified local emissions reductions in this CAP.
- If soil amendments were applied to 5% of rangeland in California, this would represent an equivalent GHG emissions reduction of 28 million MT of CO_2e over 3 years. Averaged annually, this would represent over 9 million $MTCO_2e$, which is equivalent to approximately 2% of 2012 state GHG emissions.

The MCP will continue to work with local farmers and the local NRCS office to identify farm management practices that complement compost application by building soil carbon and soil health and improving productivity and forage quality.

6.3.2.2 The Role of the County

The Marin Countywide Plan includes policies and programs that are directly supportive of this measure, including Air-1.g, *Require Control Measures for Construction and Agricultural Activity*, Air-4.d, *Reduce Greenhouse Gas Emissions from Agriculture*, and Air-4.l, *Preserve Agricultural Lands*.

The County will work with local agricultural entities to develop and implement education and outreach programs about carbon farming practices that will enhance carbon sequestration, increase soil health, climate resilience, and crop productivity. The County will assist Marin County's agriculture community, with the support of agricultural entities, to implement and expand carbon-farming practices that have been adopted by local ranchers and farmers as well as practices that have been supported by local, regional, and national conservation efforts and peer-reviewed research.

This CAP does not include any specific reduction "credit" for specific practices associated with carbon farming for a number of important reasons:

- Although highly promising, the draft carbon farms being developed by local farmers, combined with the MCP, are still a work in progress, and the specific amount of GHG reductions over time that is likely to result from such actions has yet to be finalized.
- The extent to which carbon farming can be scaled up is not yet known and will depend on the success of the initial demonstration projects that are under way in the county, the financial performance of the implemented carbon farming practices, and the sustainability of such practices over time.
- Marin County has no desire to impose additional mandates on the county's farmers and ranchers. Instead, the County desires to support the ongoing efforts of farmers and ranchers to promote sustainable agricultural practices, including carbon farming efforts.

- As noted above, Marin County farmers and the MCP are hoping to support carbon farming, in part through sale of offset credits under the California cap-and-trade system (or other offset credit schemes). All offset credit systems explicitly require that the offsets be additional to other reduction requirements or actions that would happen without payment of the offset credit. Therefore, if this CAP were to rely on (or require) reductions from carbon farming formally, then carbon farming could not qualify for the financial incentive through sales of carbon offsets. Thus, to avoid any double counting of reductions and creating any impediment to the MCP and local farmer's effort to obtain economic incentives through the sale of offset credits, the MCP reductions are not presumed in this CAP or required to meet the GHG reduction target.

6.3.2.3 Establish Marin County Carbon Stock/Sequestration Baseline and Periodically Update Inventory

As discussed elsewhere in this CAP, the current estimates of carbon stock in county agricultural and natural lands are only a rough estimate and could benefit through the collection of local data to derive a better understanding of existing levels of carbon stock and sequestration. Developing a more detailed baseline inventory is feasible but requires more effort to collect data and complete estimates.

The County, working with other partners, including the UCCE, NRCS, academic researchers, the MCP, farmers, ranchers, and other parties, will complete an inventory of carbon stocks and an estimate of annual sequestration within 2 years from adoption of this CAP Update (by mid-2017). To the extent feasible, the baseline inventory will use local data. The baseline inventory will include estimates of aboveground and belowground carbon stocks in farmed lands, ranchlands, and the county's natural lands. Carbon stock within urbanized parts of the county (urban forests) may also be included if funding is adequate, although the focus will be on agricultural and natural lands.

After completion of the baseline inventory, the County shall periodically prepare an updated estimate of carbon stock at least every 5 years to estimate changes in the carbon stock over time. As part of the updated inventory, the County will collect data from local farmers and ranchers as well as natural land managers to identify changes in practices and conditions between inventory years to understand the contributions of changes in land management practice to the changes in carbon stocks over time.

The baseline inventory and periodic updates shall be used in any future updates of the Climate Action Plan.

6.3.2.4 Carbon Farming Local Carbon Offset Protocol and CEQA Mitigation[28]

The California cap-and-trade system and other offset program protocols to validate carbon offset credits are usually complicated and data-intensive, resulting in substantial effort by parties that seek to develop offset credits for sale. The Carbon Cycle Institute has estimated that the costs associated with developing composting-based carbon farming offsets breakdown as follows: applying compost to rangelands (51%); GHG offset assertion, securing credits, and validation (39%); and monitoring (10%). A streamlined, but effective, protocol could help to lower the 39% of costs that are not associated with the actual physical work and monitoring. To support Marin farmers and ranchers,

[28] There is already an established methane digester protocol; therefore, this measure is focused on other practices.

the County will explore the potential development of a local carbon farming offset protocol to streamline procedures and practices and validate offset credits for use as CEQA mitigation. The protocol will need to follow the basic rules of "additionality" that are applied in all offset schemes and have sufficient rigor to verify the credit rationale and guarantee over time. The County may develop this for use only within Marin County or may seek economy of scale by combining with other jurisdictions in the San Francisco Bay Area and/or the BAAQMD. Given the complexity of carbon offsets, it is unknown whether such an effort will succeed in lowering the regulatory burden for Marin farmers and ranchers, but Agriculture-2 requires the County to attempt to develop such a protocol within 2 years of adoption of this CAP Update (by early 2017). If successful, the protocol would enable credits for carbon farming to be used as CEQA mitigation within Marin County (and/or in other accepting jurisdictions).

6.3.3 Agriculture-3: Promote the Sale of Locally Grown Foods and/or Products

Under this measure, the County will continue to support local farmer's markets to provide community residents with a more local source of food, potentially resulting in a reduction in the number of trips and vehicle miles traveled by both the food producers and the consumers to grocery stores and supermarkets. Given the prevalence of sustainable practices in local agriculture in the county, the use of local produce can also displace carbon-intensive food production practices elsewhere. Also, as noted above, with local farming interest in carbon farming, the promotion of local agricultural products can indirectly support carbon farming.

The University of California Cooperative Extension Marin has been actively partnering to expand the number of school and community gardens and increase the production of existing gardens through garden education. Currently, the University of California Marin Master Gardeners are working directly with more than 33 school and community gardens and facilitating policy implementation to make community gardens a permitted use in Marin's cities. The production of additional local food through community gardening that relies on sustainable practices can, in addition to its educational value, have other benefits, such as displacing the consumption of food that was produced with less sustainable methods elsewhere.