An Open Letter from Academic Leaders in Climate and Agriculture to Governor Brown, the California Legislature and California Air Resources Board Chair Nichols

April 20, 2012

Dear Governor Brown, Members of the California Legislature and CARB Chair Nichols,

We are writing to express our concern about the expected impacts of climate change on California's agriculture, and to highlight some of the most promising farming, ranching and land management practices for climate change mitigation. We call for your on-going commitment to support research, technical assistance and incentives that reduce agricultural greenhouse gas (GHG) emissions and assure the viability and resilience of the agricultural industry in the face of climate change.

Climate models predict that California farmers and ranchers will face a number of challenges in the next few decades that vary by region and crop. Among the possible impacts are uncertain water supplies[1], extreme and erratic weather events, shifting pest, disease and weed patterns, decreased winter chill hours that will lower some fruit and nut yields, and heat stress for farmworkers and livestock[2,3]. Of course, all of these changes have associated economic and environmental consequences. To assure the long-term viability of California agriculture — producer of more than half of the country's fruits, nuts, dairy and vegetables — it is essential that the state develop resources and technical assistance to guide and support farmers and ranchers in both mitigating and adapting to climate change.

Collectively, our research encompasses a wide range of agricultural land uses and practices, crops and livestock, and regions. Though there is a degree of complexity, variability and uncertainty associated with carbon sequestration and the reduction of GHG emissions in agriculture, there are trends and indicators that can be summarized as follows:

Reducing synthetic nitrogen fertilizer use and increasing its use efficiency is a high priority — Because the use of nitrogen fertilizer can result in potent nitrous oxide emissions, determining how to maintain economically viable crop yields while reducing the total amount of nitrogen applied or increasing nitrogen fertilizer use efficiency is essential. Soil management practices such as incorporation of compost and/or cover crops (i.e., crops grown primarily for soil or ecosystem improvement)[4,5,6] and conservation tillage offer some potentially promising methods to reduce nitrous oxide emissions and sequester carbon in soils. Increasing nitrogen fertilizer use efficiency can be achieved through optimizing irrigation management, application timing and improving of agronomic practices that will increase or sustain crop yields[7,8,9].

Soil management techniques have the potential to increase carbon sequestration — Various farming practices can increase soil organic matter and sequester more soil carbon on farm and rangeland, thereby capturing atmospheric carbon and lowering GHG concentrations. Promising techniques include the use of cover crops and manure additions, conservation tillage[10,11], planting perennial crops[12,13] and management of the timing and density of livestock grazing.

Importance of integrated farming systems — Research is indicating that the integration of multiple GHG-reducing practices on farms and ranches may be more effective at mitigating

climate change than adopting single agricultural practices[14]. For example, reduced tilling combined with growing cover crops has greater ability to sequester carbon than either practice alone[15,16].

Multiple co-benefits can accompany climate benefits — Many agricultural practices with climate benefits also provide additional environmental and health co-benefits such as improved air and water quality[17]. For example, properly managed livestock grazing has the potential to increase soil carbon sequestration while also increasing water retention, reducing soil erosion, increasing forage quality and enhancing wildlife habitat and native grass populations. Furthermore, practices that reduce agriculture's GHG emissions can also help the industry adapt to the coming climate changes[18].

Importance of preserving farmland — The preservation of farmland most at risk of urban and suburban sprawl development is a high priority in terms of climate change mitigation. For example, a case study conducted in Yolo County predicted that the GHG emissions from one acre of urban development are 70 times higher than the emissions from one acre of irrigated cropland[19]. By saving farmland we can avoid potentially significant GHG emissions associated with development[20].

Farms, ranches and food processors can achieve greater water conservation and energy efficiency and unleash the potential for generating renewable energy — Most of California's developed water is used by agriculture, which has a considerable energy cost and associated GHG emissions. Increasing water and energy efficiency and accelerating the production of renewable energy on farms and food processing facilities has economic and environmental benefits and helps the state reach its clean energy goals.

California continues to make strong scientific and technical contributions to identifying the most effective ways for agriculture to reduce its GHG emissions and sequester carbon, due in no small part to state government funded research efforts. For example, we are making progress on understanding and quantifying the impacts of various farming practices on nitrous oxide emissions and we are assessing carbon stocks in various California soils, plants and landscapes and finding the climate benefits of protecting farmland.

However, more research is needed to answer the following essential questions: What are the most important GHG-reducing practices appropriate to California's major crops that also derive the greatest environmental and health co-benefits? What kind of planning is needed to assure agriculture's adaptation to climate change? What tools do producers need to best protect their working lands and keep them in business in the face of an uncertain climate and water future?

We need to shore up technical assistance for producers to translate research findings into meaningful opportunities to mitigate and adapt to the coming climate challenges. Also, it will be important for farmers and ranchers to have available incentives to remove barriers for their transition to farming methods that show the greatest value in terms of GHG emissions reductions on their farms and ranches[21]. California should look to the programs of the USDA Natural Resources Conservation Service as a successful model for encouraging on-farm environmental stewardship.

While we recognize that California and the nation have entered an era of limits, we also understand that the stakes are high. California is a leader in both agriculture and environmental sustainability and we must continue to make progress in these areas to support a viable, healthy

food system. We strongly encourage your efforts to make the necessary resources available to address the significant issue of climate change and its relationship to California agriculture.

Sincerely,

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