February 21st, 2023

RE: CRES Supports SB 23-092 Agricultural Producers Use of Agrivoltaics

Dear **Bill Sponsors**: Senators Cleave Simpson and Chris Hansen, Representatives Karen McCormick, and Matt Soper;
and the **Senate Agriculture & Natural Resources Committee Members**:

The Colorado Renewable Energy Society (CRES) wants to thank the bill sponsors for bringing this bill. The CRES Policy Committee members unanimously support this bill and urge all Senate Ag & Natural Resources Committee members to vote yes to help pass this bill.

CRES is a nonpartisan, science-based nonprofit with thousands of members throughout the state. The CRES Policy Committee brings together a broad range of energy policy and technology experts who review energy bills before the Colorado state legislature to provide our perspective.

CRES strongly endorses the many opportunities offered by agrivoltaics. The co-location of solar photovoltaic arrays and agriculture supplies clean, carbon- and pollution-free energy, enhances crop yields, and provides shade for livestock, all while offering farmers and ranchers a new and steady income stream. Climate change is putting more stress on our food and water systems, and agrivoltaics can play an important role in reducing that stress.

CRES encourages everyone to visit Jack's Solar Garden in Longmont for a real-world example of how agrivoltaics can work in our state. Thank you again for bringing this bill forward and supporting it, and for all that you do for Colorado!

Sincerely,

Vincent Calvano

Chair of the Colorado Renewable Energy Society Policy Committee

703-975-6085

LEAGUE OF WOMEN VOTERS® OF COLORADO

March 31, 2023

Senate Agriculture & Natural Resources Committee
Colorado General Assembly
200 E. Colfax Avenue
Denver, CO 80203

Re: SB23-092 Agricultural Producers Use Of Agrivoltaics

Dear Members of the Senate Agriculture & Natural Resources Committee:

My name is Ann Sutton, living in Westminster CO. This testimony represents the position of the League of Women Voters of Colorado (LWVCO) on the multifaceted approach to mitigate the impacts of climate change on agriculture and water conservation including grants, studies and interagency consultations.

The League promotes carbon-free clean renewable energy resources. The bill provides grants to study and/or use solar energy generation integrated with agricultural activities and requires a feasibility study of reducing evaporation from waterways by shading from floating or suspended solar generation systems. The possible lowering of water temperature that can benefit aquatic wildlife will be evaluated.

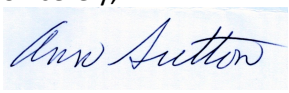
We eagerly anticipate the study of carbon sequestration opportunities through agricultural practices such as dry digesters and composting for soil enhancement.

Boulder County has offered grants to a variety of agricultural users on open space land that have shown regenerative agriculture was removing 300 tons of carbon with reducing tillage, cover cropping, adopting a grazing system and using compost rather than herbicides or pesticides. CSU has been involved with regenerative agricultural projects, which also help soils retain more moisture. Regenerative agriculture minimizes soil disturbance, uses cover crops and managed grazing. Carbon sequestration, biodiversity, efficient nutrient recycling, and yield consistency for reduced input costs are desired outcomes. https://agsci.colostate.edu/about/strategic-plan/thematic-priorities/advancing-science-of-regenerative-ag/

LWVCO encourages use of new techniques in land management and regulation which will reinforce and support our land use goals and believes that prime agricultural land and the water to make it productive should be preserved for economic, social, health, land planning, and aesthetic purposes.

We thank the sponsors for bringing this timely initiative to the legislature and thank the Committee for its careful consideration.

Sincerely,



Ann Sutton Volunteer Lobbyist
League of Women Voters of Colorado
1410 Grant Street, Suite B-204
Denver, CO 80203

Senate Agriculture & Natural Resources
04/13/2023 01:30 PM
SB23-092 Agricultural Producers Use Of Agrivoltaics
Typed Text of Testimony Submitted

Name, Position, Representing	Typed Text of Testimony
Karen Kalavity For themself	I am in support of this bill. We need more localized solar "gardens" that serve individual farmers. Thanks, Karen

Representative Dylan Roberts, Chair
Representative Nick Hinrichsen, Vice Chair
Committee on Agriculture & Natural Resources

April 4, 2023

Re: SB23-092; Relating to Agricultural Producers Use of Agrivoltaics

My name is Jane Zelikova, and I am the director of Soil Carbon Solutions Center at Colorado State University (CSU) and a joint faculty member in the Department of Soil and Crop Sciences. I received my BS in Ecology from University of Georgia and my PhD. in Ecology and Evolutionary Biology from University of Colorado.

I write in my personal capacity to highlight the importance of advancing our scientific understanding of agrivoltaics and *voluntary* greenhouse gas (GHG) emissions reductions and carbon sequestration via soils. Important scientific gaps exist for both of these topics. By targeting those knowledge gaps, *SB23-092* has the potential to provide the necessary information to scale both agrivoltaics and GHG mitigation in the Colorado agricultural sector in a rigorous and science-informed manner. The benefits of doing so include increasing the economic and environmental resilience of Colorado's agricultural sector, boosting renewable energy production, and enhancing the public health and welfare of all Coloradoans.

Agrivoltaics and soil carbon sequestration (via carbon offset markets and insetting programs) are gaining significant momentum and financing, but filling critical knowledge gaps is essential to realizing the benefits of these approaches and minimizing risks. Below, I focus my testimony on agricultural GHG emissions and soil carbon sequestration, which are more closely within my area of expertise. I also briefly outline the need for additional agrivoltaics research.

Drought, heat, and other climate impacts threaten the economic and environmental viability of agriculture in Colorado. In fact, we are currently experiencing a megadrought - the worst in 1200 years. Nation-wide, farmers are experiencing not only the harsh impacts of climate change but also increasing production costs. Sustainability and climate resilience are therefore key interlinked goals for Colorado agricultural production. Increasing carbon in agricultural soils can help improve soil health as well as enhance sustainability and climate resilience.

Recently, there has been a burgeoning interest in carbon markets that pay producers for soil carbon sequestration associated with shifts in agricultural management. Depending on the management shift, there can also be environmental and economic co-benefits for producers and climate benefits for all Colorado citizens. Despite rising interest, very few farmers and ranchers (~less than 3%) participate in carbon markets today, citing a number of barriers, including uncertain financial benefits, lack of technical assistance for the implementation of new practices, contracting terms that do not match production cycles, and lack of trust in the markets themselves. The bulk of investment to date and the majority of participants are in the Midwest. Colorado producers may therefore be missing out on the benefits associated with shifting their

agricultural practices and potential for an additional source of income, if they can sequester more carbon by managing their operations differently.

For carbon markets to deliver both financial and climate benefits credibly and with scientific rigor, we must characterize the economic, environmental, and social benefit and address key uncertainties in the potential for soil carbon sequestration across Colorado agricultural production systems. These uncertainties include:

- The magnitude of potential GHG emission reductions and carbon sequestration across the Colorado agricultural sector.
- The permanence, verifiability, and additionality of soil carbon sequestration from a variety of agricultural management practices. In fact, the vast majority of research on soil carbon sequestration in agricultural systems has been conducted in Midwestern croplands and Colorado agricultural systems are distinct, with their own sets of opportunities and challenges.
- Baseline methane and nitrous oxide emissions from Colorado feedlots - non-CO2 emission estimates are based on national numbers that may not be representative of operations based in Colorado. Relatedly, we also need to characterize the climate, animal welfare, and economic impacts of potential GHG mitigation mechanisms, including manure management, changes to feed, and the use of dry digesters.
- An appropriate price for carbon payments based on the costs of creating a robust and credible carbon credit and risks of shifting agricultural management practices for the long periods of time carbon markets often require (e.g., 5 to 10 years). Payments for many carbon markets may not cover the price of adopting management shifts. There may also be other financial risks for producers, such as yield impacts, which with insufficient carbon pricing may jeopardize the final viability of operations.

Our lack of understanding these and other factors creates economic risk for agricultural producers and increases the potential for greenwashing. While CSU's Soil Carbon Solutions Center and AgNext exist to and are working to fill fundamental knowledge gaps, substantial additional resources are needed to understand the socio-economic dimensions that are relevant for Colorado producers.

Agrivoltaics. The agrivoltaic sector is projected to grow at a rate of 10.1% through 2031 and there is rising interest in co-developing renewable energy, food production, and ecosystem services. The Soil Carbon Solutions Center has received several inquiries from solar companies and project developers seeking advice on how to develop systems that maximize ecosystem services as well as questions about which crops or animal grazing systems are well suited for agrivoltaic development. We have also received some inquiries from livestock producers who are interested in potential co-benefits like reducing livestock losses from heat stress (~$1.69 to $2.36B annually in the US) .

Today, adoption of agrivoltaics is much lower than its potential, in part because of scientific uncertainties that create industry, producer, and environmental risk. Questions about what types of agricultural operations can successfully incorporate solar installations and what the

impacts will be on yield, crop quality, and land and animal health all must be answered in order to guide optimal deployment of solar into agricultural contexts. There are also questions on the solar infrastructure side, from how these systems should be designed to the capital investment required to enable their integration into agricultural production.

For this reason, CSU has invested substantial financial and human resources in agrivoltaics research. CSU is part of a $10M USDA National Institute of Food Agriculture Research project to research and develop optimal design for agrivoltaics systems in crop production. The College of Agricultural Sciences and the Colorado Agricultural Experiment Station have invested $160,000 to help CSU researchers develop competitive grants to fill knowledge gaps. But taking fundamental research from CSU into the real world will require additional investment to ensure agrivoltaic systems are tailored for Colorado agricultural contexts, guiding deployment with rigorous science.

In sum, without advancing our scientific and socio-economic understanding of the opportunities associated with agrivoltaics and soil carbon sequestration in Colorado agricultural lands to guide deployment, Colorado risks not realizing all of the potential benefits that they may hold for Colorado citizens.

Sincerely,

Jane Zelikova