

Colorado Agrivoltaics Outreach & Engagement

Engaging Colorado producers to explore opportunities & barriers for agrivoltaics



Executive Summary

Colorado needs both renewable energy and productive, resilient farms and ranches.

Agrivoltaics—integrating agriculture within solar arrays through the life of the project—can be a solution. In many ways, agrivoltaics represents a win-win opportunity for producers, developers, and communities. Exciting new research and demonstration projects are documenting the potential for agrivoltaics to increase water use efficiency, improve productivity for some crops, and generate diversified income streams for farmers and ranchers. However, there are significant barriers to the adoption of agrivoltaics including knowledge gaps, economic frameworks, technical concerns from producers, and a lack of assistance to bridge the gaps between stakeholder groups.

This project involved extensive outreach and engagement with Colorado farmers and ranchers to understand their awareness, attitudes, interests, and concerns to identify opportunities and barriers to agrivoltaics adoption in Colorado.

Through a statewide survey and a series of roundtables, American Farmland Trust (AFT), in partnership with AgriSolar Consulting, Colorado State University Extension, and Colorado Open Lands, captured the interests and concerns with agrivoltaics of Colorado producers, technical service providers, and solar developers. The project team engaged 312 producers in the survey and approximately 180 participants in roundtables to understand perceptions and barriers to participation and to inform recommendations for future agrivoltaics research, policy, and educational resources needed to accelerate adoption.

Takeaways from Survey and Roundtables

The findings from the two approaches reinforced each other leading to the following takeaways from Colorado producers:

- Concern about the negative impacts of climate change on farming and had a strong preference for siting solar projects on less productive or underutilized farmland.
- The importance of continued farming activity and land restoration after solar projects was also emphasized.
- Interest in agrivoltaics and understanding potential benefits, including funding opportunities and case studies demonstrating economic impacts for farm operations.
- Desire for more information, materials, and resources from trusted sources to understand the opportunities and challenges.
- Expanded field demonstrations and peer-to-peer learning will help answer questions and demonstrate successful approaches.
- Need for robust technical assistance and access to trained advisors to develop individual agrivoltaics projects—farm plans and solar designs
- Providing supportive policies, programs, and financial incentives are critical to expanding the adoption of agrivoltaics across the state.

Recommendations

By addressing the concerns and providing the support producers say they need to pursue agrivoltaics, Colorado can advance its renewable energy goals while maintaining agricultural viability and sustainability. The project recommends the following actions:

1. Increase educational outreach through trusted organizations to facilitate education through field demonstrations, peer-to-peer learning, workshops, and informational materials
2. Establish a technical assistance program for agrivoltaics to support producers with feasibility studies, site assessments, and project planning services for agrivoltaic installations.
3. Introduce financial incentives including targeted tax incentives, grants, and low-interest loan programs to lower cost barriers for developers and maximize co-benefits (e.g., water conservation, drought resilience, community benefits).
4. Support partnerships to foster inter-agency & cross-sectoral collaboration with state agencies, research institutions, agricultural producers, electric utilities, and solar developers.
5. Work to create more supportive zoning regulations and land-use policies that enable agrivoltaic projects.
6. Engage stakeholders through ongoing communication channels with surveys, focus groups, and advisory committees to gather input from farmers, landowners, and other stakeholders and to co-develop state research and development priorities. Use this engagement to proactively adapt policies and programs as needed.
7. Develop accessible online resources, such as an agrivoltaics toolkit and resource portal to highlight learning opportunities, research findings, technical guides, research & demonstration plots, funding opportunities, and best practices in Colorado for agrivoltaics.
8. Ensure that research and partnerships actively focus on promoting diversity, equity, and

inclusion to ensure the benefits of agrivoltaic systems are accessible to all.

Summary of Producer Survey Findings

AgriSolar Consulting designed and managed the survey to advance the understanding of Colorado agricultural sector interests and concerns with agrivoltaics. The survey targeted producers across the state through a variety of outreach mechanisms and received over 300 responses, which provided valuable, novel information on producer attitudes and awareness regarding agrivoltaics. The survey had several objectives: 1) identify producers’ perceived interests and benefits of agrivoltaics; 2) assess factors of concern and reasons for opposition towards agrivoltaics; and 3) determine what type of information and resources producers are interested in related to agrivoltaics.

Concerns

One of the foremost concerns among respondents is the potential negative impact of solar projects on land conservation and farm productivity. Most are very concerned about impacts on land conservation (61%), farm productivity (57%), tenant farmers/ranchers/leases (57%), the visual landscape (57%), farm and ranch viability (57%), soil quality (56%), land prices and access (52%), and impact on agricultural water rights (51%).

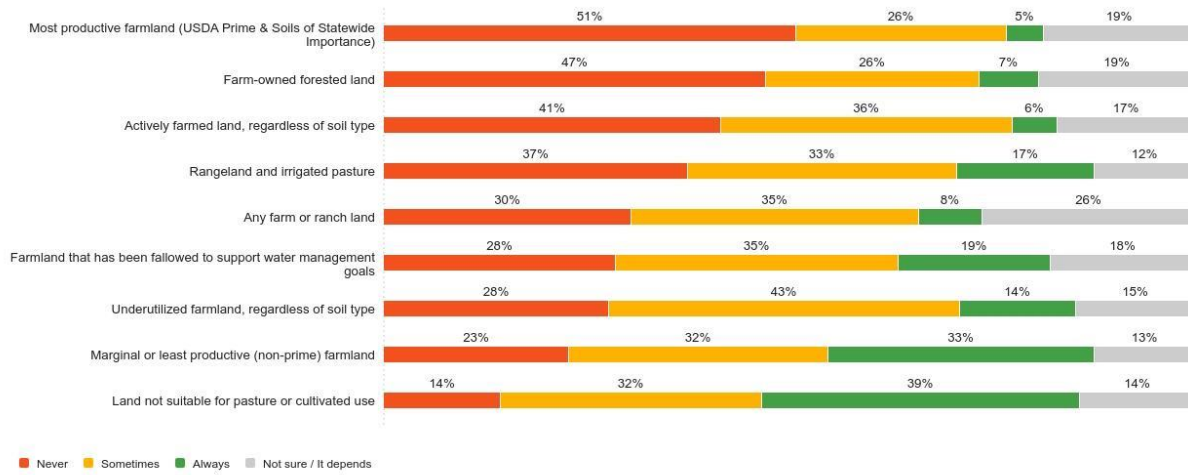
Impacts of concern for solar development on agricultural land in Colorado (n=234)



The data reveals a strong preference for siting solar projects on less productive or underutilized farmland rather than on highly productive or actively farmed land. Respondents show the highest support for using marginal or least productive land (33% always in favor) and land not suitable for pasture or cultivation (39% always in favor), indicating a strategic choice to minimize the impact on prime agricultural areas. There is significant opposition to placing solar projects on the most productive farmland (51% never in favor) and farm-owned forested

land (47% never in favor), reflecting concerns about preserving these natural resources.

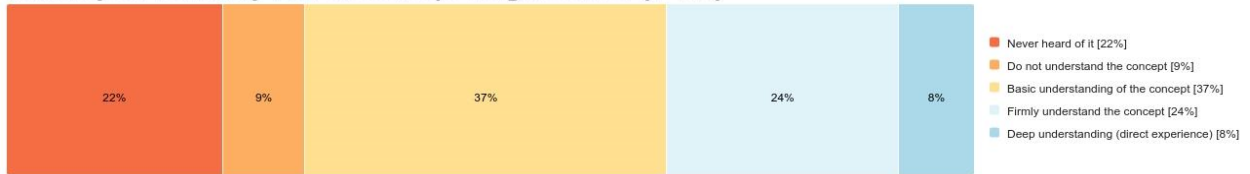
Preferences for solar siting based on farmland type. (n=219)



Awareness

Agrivoltaics is not well known or widely practiced among producers with 31% having never even heard of agrivoltaics (22%) or do not understand it (9%), while only 37% have a basic understanding and 32% have a firm or deep understanding.

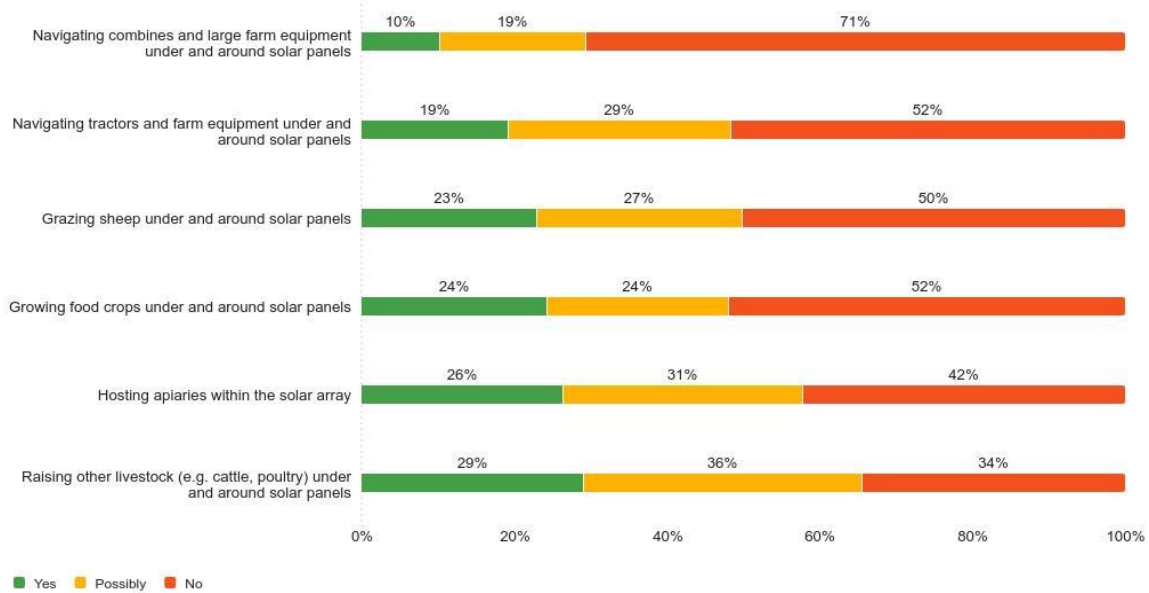
What is your familiarity with the concept of agrivoltaics? (n=249)



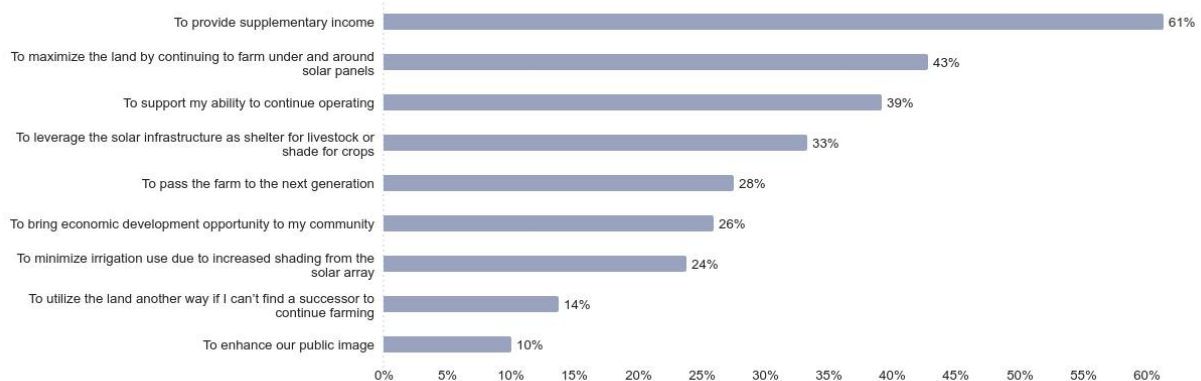
Opportunities

Most producers are willing, or possibly willing to engage in agrivoltaic activities (up to 65%) and most indicate generating supplemental income would influence them to lease their land (61%).

Willingness to engage in agrivoltaic activities. (n=208)



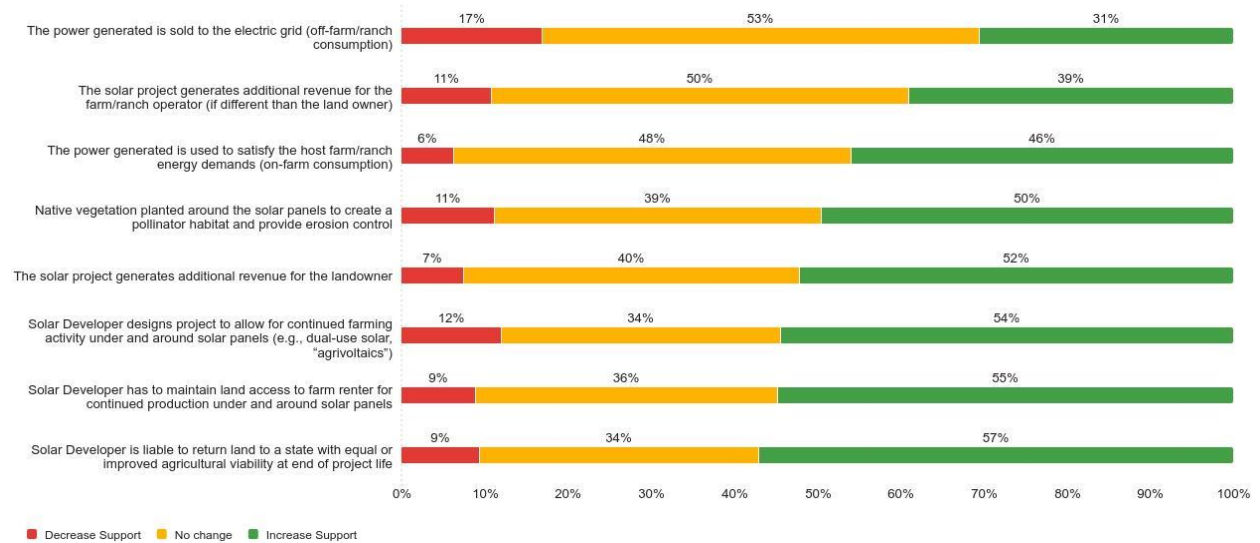
Motivation to lease land to a solar developer. (n=189)



Factors Affecting Support for Solar

Support for solar is greater if projects protect farming potential such as protecting agricultural viability (57%), maintaining access to land to farm (55%), agrivoltaics projects (54%), and more generally generating revenue for landowners (52%).

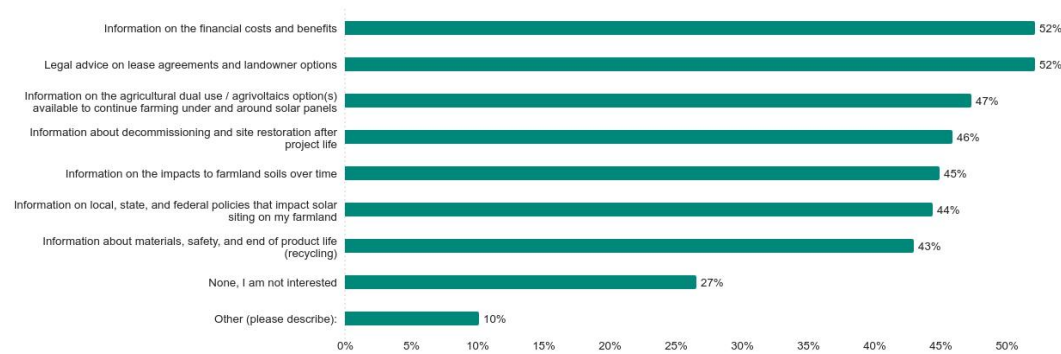
How solar development and energy generation conditions affect support for solar. (n=228)



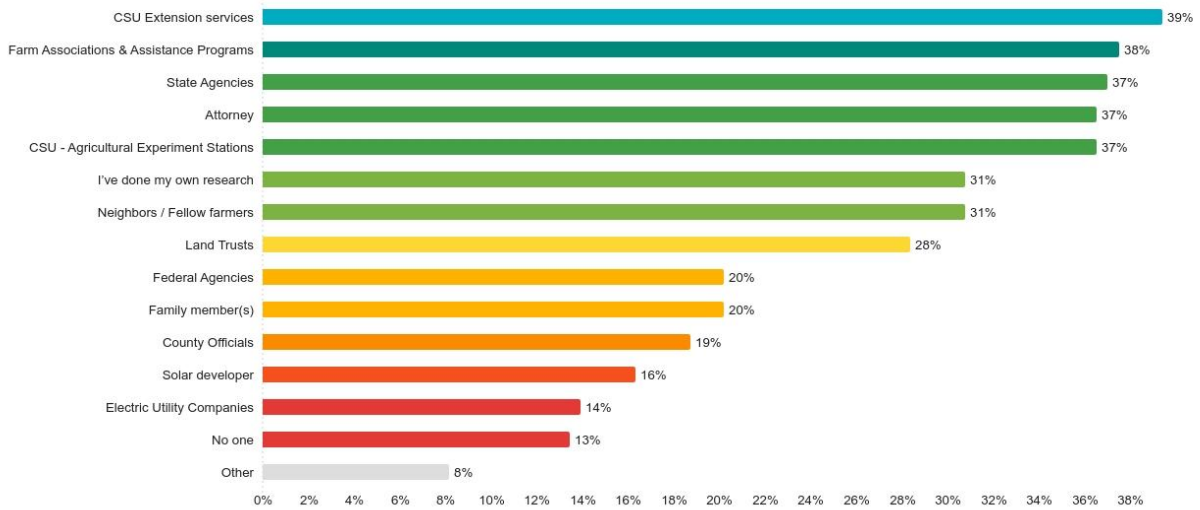
Information Needs

Producers identified a need for more accessible and clear information from trusted sources about agrivoltaic systems, and solar energy development in general including land lease agreements, insurance, ownership, guidance on relevant regulations and incentives, and durability of panels in harsh conditions. Producers indicate that information about financial costs and benefits (52%) along with legal advice related to lease agreements and ownership (52%) are the most important when making decisions about leasing land for solar development. Farmers and ranchers expressed a strong preference for traditional and established sources of information, such as extension services, farm associations, NGOs, state agencies, and university-affiliated research stations. Solar developers and electric utilities were the least trusted sources.

Services or information for decision making about leasing land to host solar. (n=207)



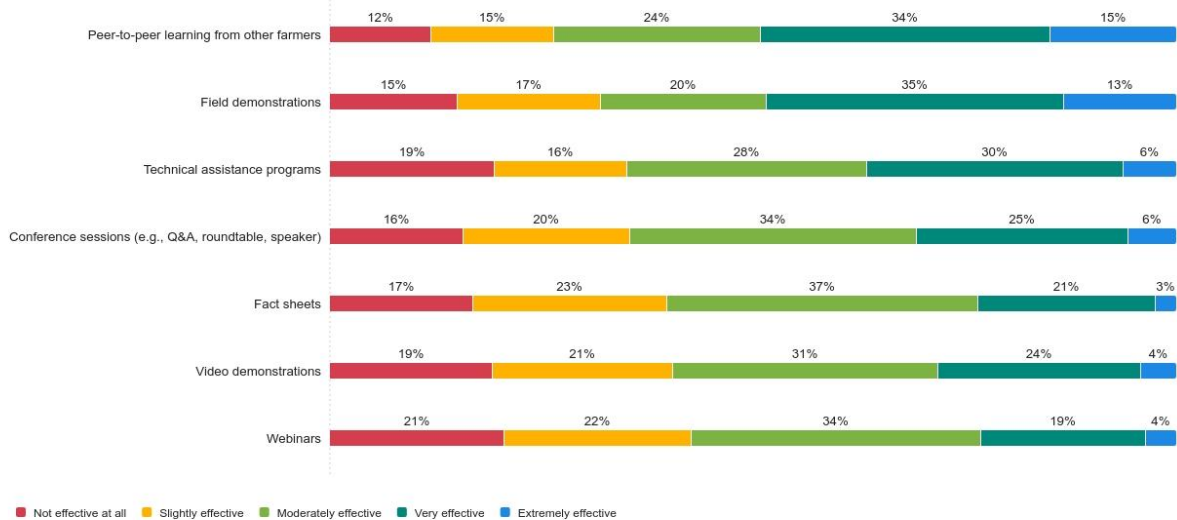
Who producers trust for information about agrivoltaics. (n=208)



Effective Engagement

Effective and accessible information is critical to the adoption and implementation of agrivoltaic systems. Survey findings demonstrated that farmers prefer learning through field demonstrations, peer-to-peer learning, and find conference sessions and facts sheets to be effective means of information distribution. These preferences should guide the development of targeted information distribution strategies that address the diverse needs and concerns of the agricultural community.

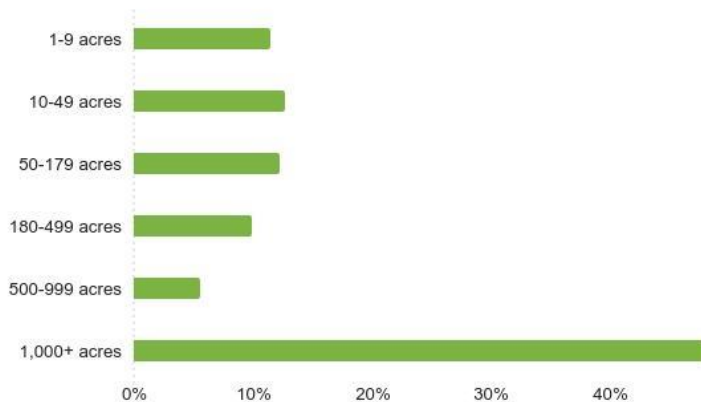
Efficacy of information distribution techniques? (n=200)



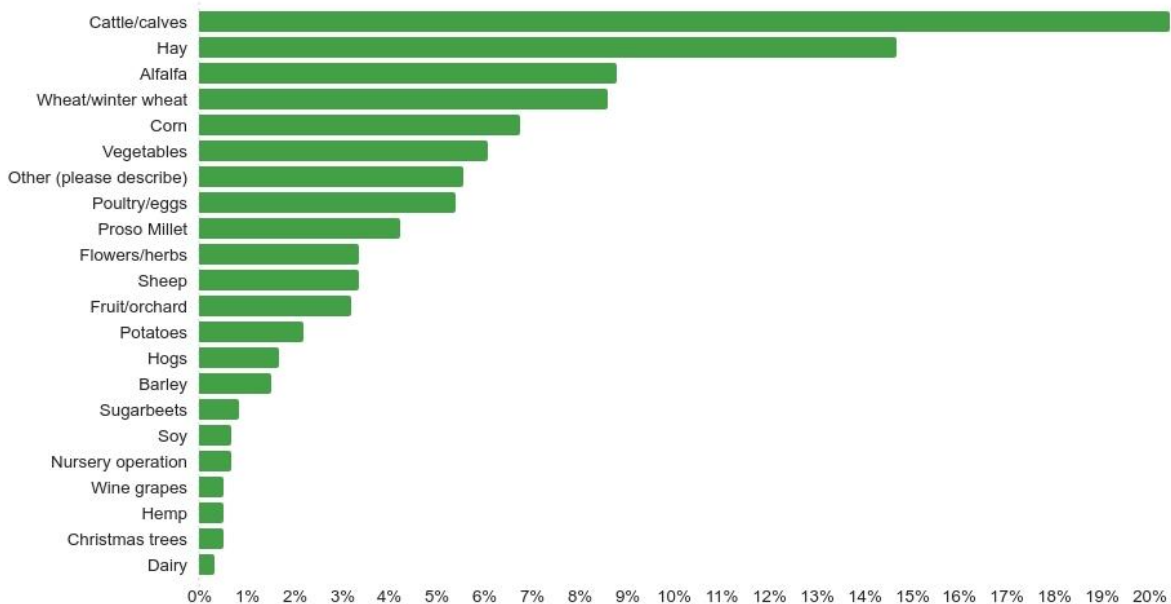
Demographics

Respondents came from 50 out of Colorado’s 64 counties and were dominated by larger farms. The majority, over 40%, manage larger farms (over 1,000 acres), just under 10% for large farms (500-999 acres), 15% for mid-size (180-499 acres), and 10-15% from smaller operations (less than 180 acres). Cattle (20%) and hay (15%) operations led the respondents, followed in descending order by alfalfa and wheat, corn, vegetables, and other unspecified products.

How many total acres, on average, are a part of your agricultural operation? (n=252)



Which of the following do you primarily grow or raise on your operation? (n=201)



The complete survey report is available from AgriSolar Consulting with additional data and the questionnaire.

Summary of Roundtable Findings & Observations

To supplement the agrivoltaics survey, AFT and its partners engaged nearly 200 producers, service providers, and solar developers across Colorado from January to June 2024 in nine roundtables to allow them to express perceptions, concerns, and questions about agrivoltaics. The roundtables varied in design, location, and approach, ranging from intimate conversations among five to ten producers to conference sessions with 20 to 50 participants. The project team also conducted two virtual roundtables with 45 producers and service providers in one and 15 solar developers and stakeholders in the other. The project team went to farm shows and other events where producers were gathering to ensure that they engaged a broad spectrum of farmers growing different crops and ranchers from different parts of Colorado.

Producers again and again were clear that they needed additional information on agrivoltaics to understand the opportunities and challenges including soil impacts, crop impacts, operational efficiency, and decommissioning. Producers also conveyed the need for more accessible information on agrivoltaics, covering topics including feasibility, siting processes, decommissioning, and funding opportunities. Producers saw opportunities to improve farm viability, diversify revenue, and improve resiliency in the face of extreme heat and drought. However, producers also expressed frustration with slow permitting, high upfront costs for engineering design, and burdensome – in terms of time and cost – applications for federal funding.

One key challenge for producers pursuing agrivoltaics is the difficulty of leveraging funding from USDA's Rural Energy for America Program (REAP) to fund agrivoltaics. There are major barriers to accessing REAP funding, including application time & cost, high interconnection costs, difficulty of selling excess electricity generation, need for upfront capital, and monetization of federal tax credits. Absent structural changes to REAP, new funding mechanisms for agrivoltaics projects, or new solar development business models, it is unlikely that producers will retain ownership stakes in agrivoltaic projects. Rural electric cooperatives (RECs) are likely better positioned than individual producers to benefit from federal funding. Like producers, RECs can access funding from USDA (including REAP). However, unlike producers, RECs can claim direct pay of the solar investment tax credit, take care of interconnection & offtake themselves, and more easily access debt & financing for projects.

These insights track closely with the findings from the quantitative statewide survey and lead to the following takeaways:

- Producers are interested in agrivoltaics and see potential benefits.
- Producers want more information, materials, and resources to help them understand the opportunities and challenges associated with agrivoltaics.
- Expanded on-farm research and demonstration projects will help answer questions and demonstrate successful approaches.
- Producers need help from trained advisors and technical assistance programs.
- Supportive policies, programs, and incentives are critical to accelerate agrivoltaics adoption in Colorado.
- The state should encourage rural electric cooperatives to use federal funding (USDA programs, solar investment tax credit) for community-driven agrivoltaics projects.