



I-WEST

Intermountain West Energy
Sustainability & Transitions

WORKSHOP SUMMARY

Advancing the Bioeconomy in the Intermountain West

Virtual workshop held January 25, 2022

WORKSHOP FACILITATORS

Babetta Marrone (blm@lanl.gov)

Beau Hoffman (beau.hoffman@ee.doe.gov)

Sheila Van Cuyk (svancuyk@lanl.gov)

I-WEST PRINCIPAL INVESTIGATOR

Rajesh Pawar

(rajesh@lanl.gov)

I-WEST PROJECT MANAGER

Rachel Atencio

(Rcatencio@lanl.gov)

SUBMITTED TO

U. S. Department of Energy
Office of Fossil Energy and Carbon Management
Bioenergy Technologies Office

February 15, 2022

LA-UR-22-21600

Summary of Workshop on Advancing the Bioeconomy in the I-WEST region

This workshop was focused on the role bioeconomy related technologies will play in achieving carbon neutrality in the Intermountain West region.

The bioeconomy—including bioenergy and bioproducts—will be an important component of the portfolio of technologies needed for energy transition in the Intermountain West and will likely present regional economic opportunities. This workshop provided perspectives from current bioenergy and bioproducts companies in the I-WEST region and solicited input from potential users on issues related to development, deployment, employment, and usage of bioenergy and bioproducts. The primary goal of this workshop was to discuss business models and technology pathways that will evolve over the next 5, 10, and 15 years. The primary topics discussed in the workshop included:

- Bioenergy and bioproducts industries in the region
- Technical challenges faced by bioenergy and bioproducts industries in the region
- Economics, policy, and workforce issues affecting bioeconomy opportunities in the region
- Benefits and risks of growing the bioeconomy in the I-WEST region

In addition to informing the I-WEST technology roadmap, this workshop was intended to expand regional knowledge of bioenergy and bioproducts technologies and their implementation in the I-WEST region. The workshop also served as an opportunity to build partnerships and regional coalitions for facilitating a just and equitable regional energy transition.

The four-hour invitation only workshop was held virtually due to COVID restrictions. The workshop included over 100 participants including more than 60 stakeholders from over 20 different organizations (section 1.1).

The format of the workshop centered on introductory lightning talks (section 1.2) followed by two moderated roundtable discussions (section 1.3). The first focused on technology-related factors while the other focused on policy and community topics. During roundtables, the moderators provided a short introduction to each session and then facilitated dialog around a set of questions (section 1.4) that were provided to participants in advance of the workshop.

Key takeaways from the workshop are summarized below and discussed in detail in Section 1.5.

- Multiple bio-energy related technologies are currently being deployed in the I-WEST region. These technologies include modular, portable technologies as well as integrated, circular systems.
- The type of applicable technologies in the region will primarily depend on the feedstock with forest residues, manure and wastewater being the primary choices. Given the closer ties between Bioeconomy related technologies with other important regional economic sectors (e.g. agriculture, forestry, etc.), it is important to ensure that there is no competition for natural resources.
- Promotion of distributed model of smaller scale technologies, empowering local communities as well as deploying projects that engages local communities can help accelerate deployment.
- Given that the bioenergy related technologies tend to be on the smaller side, providing technical assistance to small project developers as well as actively developing workforce through new technology focused vocational training are some of the critical steps that need to be taken.

1.0 Details on the Workshop

1.1 Workshop Attendees

STAKEHOLDERS

Name	Company Name	Job Title
Alberto Ferrer	Power Renaissance	Senior Executive
Andrea Bailey	DOE BETO	Technology Manager
Andrew Hegewald	Dominion Energy	
Andrew Taylor	DOE BETO	Communications Fellow
Anne Otwell	DOE	
Beau Braunberger	Thermosolv	
Beau Hoffman	DOE BETO	
Bergen Eskildsen	Utah DNR, Forestry Division	Wood Utilization Coordinator
Betty	OGCI Climate Investments	Technology Principal
Bri Farber	Boston Government Services	Program analyst
Brian Doughty	Individual	Consultant
Caroline Arkesteyn	DOE-BETO	Task Lead/Project Manager II
Charles Curtin	Sangre de Cristo Initiative	I-WEST Partner
Charlotte Levy		
Christy Sterner	U.S. DOE, BETO, Advanced Algal Systems Program	Technology Manager
Clarissa Bhargava	Office of U.S. Senator Ben Ray Lujan	Legislative Fellow
Dale Keairns	Deloitte Consulting	Specialist Master
Dan Huben	AECOM	Director, Project Management
Daniel Fishman	DOE BETO	Technology Manager
Dorothy Moloney	NA	concerned citizen
Edith Valadez	TYR energy logistics llc	Project manager
Erik Meuleman	ION Clean Energy	CTO
Erika Moeller	Xcel Energy	Corporate Development Consultant
Eva Rodezno	DOE	
Gautam Phanse	Chevron	Strategic Relations Manager
Gayle Bentley	DOE BETO	

Gordon West	The Trollworks LLC	Director
Greg Guard	Clearas, MT	CEO
Hariprasad Janakiram Subramani	Chevron	Strategic Relationship Manager
Huyen Dinh	NREL	scientist
Indra Bhattacharya	Tri-State Generation and Transmission Association, Inc	R&D Program Manager
Isabelle Jenniches	New Mexico Healthy Soil Working Group	Co-Founder
Jai-woh Kim	U.S. Department of Energy	Senior Program Manager
James Skeet	Covenant Pathways, NM Sovereign	
Jeffrey Eppink	Enegis, LLC	President
Jennifer Wade	Northern Arizona University	Assistant Professor
John Litynski	US DOE	Director Carbon Transport and Storage
Kari Burkhow	Marathon Petroleum	Transportation Analyst
Ken McQueen	Kenergy Consulting LLC	Principal
Kim Magrini	NREL	Principal Scientist
Larry Tree	Proteum Energy, LLC	President/CEO
Marianne Wilkerson	U.S. Senator Lujan's office	Fellow
Michael Goldstein	TRIO Renewable Gas, Inc.	President
Mindy Gottsegen	Colorado State Land Board	Conservation Services Manager
Nick Ralston	Sage Green NRG	Director
Nikhil Patel	Singularity Energy Technology, LLC	President
Peter Montalvo	AECOM USA	Senior Project Manager
Phil Patman	Ameresco	Vice President
Raymond RedCorn	Senator Martin Heinrich	Science Fellow
Robert Hockaday	Tucumcari Bio-Energy Company Inc.	President
Seth Villanueva		
Sonia Hammache	DOE BETO	
Sri Tulastono	U.S. DOE, BETO	
Taylor Vactor	KeyLogic	Support Contractor NETL
Timothy Grant	KeyLogic	Support Contractor NETL
Trevor Smith	U.S. DOE, BETO, Advanced Algal Systems Program	Technology Manager
Valerie Reed	DOE Bioenergy Technology Office	Director

I-WEST TEAM

Name	Company Name	Job Title
Alan Krupnick	Resources for the Future	
Andrea Maestas	LANL	Admin
Aspen Peterman	LANL	SULI Intern - EES-14
Babetta Marrone	LANL	
Bill Brandt	ASU	Director of Strategic Integration
Brooke Tucker	University of Utah	Programs Manager
Cesar Gonzalez Esquer	LANL	Scientist
Christina Steadman	LANL	Staff Scientist/Principal Investigator
Crystal Gallegos	LANL	
Daniel Raimi	Resources for the Future	Fellow
Dave Morgan	NETL-DOE	
David Hodge	Montana State University	Professor
Derek Vikara	NETL Support Contractor	Subsurface Energy Analyst
Don Remson	NETL-DOE	Analyst
Donatella Pasqualini	LANL	Scientist
Elizabeth Hong-Geller	LANL	Division Leader
Eric Lewis	NETL-DOE	Research General Engineer
George Guthrie	LANL	dep prog director
Janie Chermak	UNM	Professor
Jeffrey Heikoop	LANL	Group Leader
John McGowen	ASU	
Jolante Van Wijk	LANL	Science Manager
Joseph Dumont	LANL	Scientist
JS Shih	Resources for the Future	Fellow
Julie de Leon	LANL	
Jurgen Schmidt	LANL	Scientist
Katherine Chou	NETL-DOE	Science Researcher and Manager
Lee Spangler	Montana State University	Director, Energy Research Institute
Luciane Cunha	NETL-DOE	Supervisory Research/General Engineer

Marc Witkowski	TRIAD National Security, LLC	Business Development Executive
Marianne Francois	LANL	Division Leader
Melissa Fox	LANL	Program Director
Mohamed Mehana	LANL	Scientist
Paolo Patelli	LANL	Scientist
Rachel Atencio	LANL	Project Management
Rajesh Pawar	LANL	Scientist
Ranalda Tsose	Montana State University	Postdoctoral research fellow
Rommel Granja LANL	LANL	Postdoc research
Ryszard Michalczyk	LANL	Group Leader
Sandrasegaram Gnanakaran	LANL	Scientist
Scott Matthews	NETL-DOE	
Selena Gerace	University of Wyoming's School of Energy Resources	Research Scientist
Shawn Starckenburg	LANL	Deputy Group Leader
Sheila Van Cuyk	LANL	Program Manager
Stephanie Wettstein, MSU - Bozeman	Montana State University	Associate Professor
Taraka Dale	LANL	Scientist
Troy Semelsberger	LANL	Scientist

1.2 Workshop Presenters

Name	Company Name (location)	Job Title
Robert Hockaday	Tucumcari Bio-Energy Company (NM)	President
Isabelle Jenniches	NM Healthy Soil (NM)	Co-Founder
Gordon West	The Trollworks (NM)	Founder, CEO, CTO
Ranalda Tsose	Diné (Navajo) perspective (MT)	NSF Earth Sciences Postdoctoral Fellow, Montana State University

James Skeet, Joyce Skeet	Covenant Pathways (Navajo Nation, NM)	Co-Founders
Michael Goldstein	Trio Renewable Gas (CA)	President
Nikhil Patel	Singularity Energy Technologies (ND)	President
Bergen Eskildsen	Utah Division of Forestry, Fire, and State Lands (UT)	Wood Utilization & Business Development Coordinator
Charles Curtin	Sangre de Cristo Initiative (NM)	Co-Director
Greg Guard	CLEARAS (MT)	CEO
John McGowen	Arizona Center for Algae Technology and Innovation (AzCATI) at Arizona State University (AZ)	Director

1.3 Workshop Agenda

Time	Topic	Presenter
9:00-9:10	Introduction and I-WEST Overview	George Guthrie Los Alamos National Laboratory
9:10-9:20	Welcome from DOE Bioenergy Technologies Office (BETO)	Valerie Sarisky-Reed Director, DOE-BETO
9:20-9:30	Bioenergy State and Local Programs and Opportunities	Beau Hoffman Technology Manager, DOE-BETO
9:30-9:40	Workshop Format	Babs Marrone & Sheila Van Cuyk Los Alamos National Laboratory

Time	Topic	Presenter
9:40-10:50	Lightning Talks: Five-minute presentations (see Section 1.2) will introduce regional projects and/or company and community stakeholder perspectives on the potential role a robust bioeconomy can play in decarbonizing the Intermountain West. Please use the chat to document your questions throughout the presentations so they can be addressed during the roundtable discussion. Moderator: Sheila Van Cuyk	
10:50-11:00	Break	
11:00-11:55	Roundtable Discussion: Technology	Moderators: Beau Hoffman, DOE-BETO Babs Marrone, LANL
11:55-12:50	Roundtable Discussion: Community & Policy	Moderators: Babs Marrone, LANL Beau Hoffman, DOE-BETO
12:50	Wrap up and Conclusion	Babs Marrone & Sheila Van Cuyk LANL

1.4 Workshop Prompts/Questions

The following questions were provided to the workshop presenters to address during the round table discussions. Participants were asked to focus on the relevance to the I-WEST region (MT, UT, MT, NM, AZ, CO). Workshop participants were encouraged to formulate follow-up questions prior to the workshop and/or raise them during the roundtable discussion.

Technical roundtable

- *Upsides/downside of region:* What is most attractive to you about this region? Are there any unique value propositions of your technology that are particularly attractive to this (I-WEST) region or geography? What motivated you to build your business in the I-WEST region? (e.g. workforce, proximity to feedstock, proximity to end-markets, supportive policy, etc.). Can you point to a specific advantage of the I-WEST region?
- What are some of the biggest technical challenges (specific to your facility or technology) you face trying to grow your business in the I-WEST region?
- What regional infrastructure/resources are critical enablers for your project? What infrastructure needs might need to be built out to better enable your technology/process?
- What do you envision for the scale (e.g. pilot-ready, commercializing) of your technology in the I-WEST region by the end of the decade?
- Where is more R&D needed in order for you to be successful in the next 5, 10 or 15 years?
- Do you see any opportunities for bioenergy/bioproducts businesses in the I-WEST that are not being discussed here?
- What technical barriers exist that limit the deployment at large scale in the regions? What technology advancements would further facilitate deployment in the region?
- What do you see as priority environmental indicators for your facility (e.g. greenhouse gases, local air quality, water usage, traffic, etc.)?
- Are there environmental considerations that are unique to this region or sub-regions compared to other projects you may have?

Community stakeholder's roundtable

- Can you provide an example of a successful community outreach effort that you are proud of?
- How have you interacted with communities where your business is located? Have you had unexpected outcomes from these interactions? (What have been some of the challenges you have faced in interacting with local communities?)
- Do you have any advice, lessons learned, or best practices to share with your colleagues here today?
- How do the current and planned local/state/federal policies limit or facilitate deployment of your technology?
- What is the societal acceptance of deployment in the region of your project and what are the challenges?
- What are the financial constraints limiting large scale deployment in the region? Do you have suggestions on potential pathways to address financial constraints? What project operational lifespan (e.g., 10 years of operation) is needed for financial viability?
- What are the economic impacts (e.g. jobs, revenue) of deployment of your technology for the local community and state/region?
- What were your considerations for issues such as access to skilled workforce?
- What are your envisioned long-term prospects of your technology in a regional net-zero economy?

Wrap-up

- What were your expectations and hopes for this workshop? Were they met?
- How would you like us to follow up with you? (Available for 1:1 discussion?)

1.5 Summary of the Bioeconomy Workshop and Key Takeaways

The presenters and attendees of the Bioeconomy Workshop represented the I-WEST region (UT, NM, WY, CO, AZ, MT) with a broad range of expertise ranging from R&D, policy and regulation, early- to mid-stage activities and infrastructure—the necessary components to build a regional coalition to decarbonize the I-WEST. The affiliations of the workshop participants ranged across academic institutions, national laboratories, state and federal government, sovereign nations, and companies. This workshop had significant representation and participation of small business, grass root organizations as well as local communities. Overall, the workshop led to some key outcomes and lessons:

General outcomes:

1. It provided an opportunity to foster new collaborations among the participating regional stakeholders
2. The regional stakeholders recognize that a regional, grassroots carbon-neutral strategy is the best approach for the long-term economic viability of the region,
3. The primary barriers to a carbon-neutral region are not technology based, but rather the adherence to a long-term commitment by the government, by establishing supporting policy and regulations, and developing supporting infrastructure.
4. There will be trade-offs between different technologies during the transition to a net-zero carbon energy economy.

Bioenergy-specific outcomes:

5. Multiple bio-energy related technologies are currently being deployed in the I-WEST region. These technologies include modular, portable technologies as well as integrated, circular systems.
6. The type of applicable technologies in the region will primarily depend on the feedstock with forest residues, manure and wastewater being the primary choices. Given the closer ties between Bioeconomy related technologies with other important regional economic sectors (e.g. agriculture, forestry, etc.), it is important to ensure that there is no competition for natural resources.
7. Promotion of distributed model of smaller scale technologies, empowering local communities as well as deploying projects that engages local communities can help accelerate deployment.
8. Given that the bioenergy related technologies tend to be on the smaller side, providing technical assistance to small project developers as well as actively developing workforce through new technology focused vocational training are some of the critical steps that need to be taken.

The workshop began with speakers from the Bioenergy Technologies Office: Director, Valerie Sarisky-Reed, followed by Program Manager, Beau Hoffman. Combined, both of them made some key points, starting with perspectives from the Biden Administration's decarbonization strategies and the role of bioenergy and the net zero goals.

- It was identified that the most important paths relevant to bioenergy are the decarbonization of transportation, decarbonization of industry through chemicals and the decarbonization of agriculture. Biomass is the only renewable source of carbon from which electricity, liquid fuels, and chemicals can be made. Liquid fuels from biomass may be the only low to zero carbon fuel option, particularly for difficult to electrify transportation sectors such as, aviation, marine and rail. Multiple programs are currently available and additional are expected to be available in near future to support local community efforts and small businesses in the bioenergy area. BETO recognizes that it will require many different local efforts to reach carbon neutrality in the I-WEST region. Building successful partnerships requires 4 R's: Relationality (what is motivating the developer?) Relevance (What problem is being solved?) Reciprocity (are both partners exchanging information?) Respect (Are you adhering to the other 3 R's?).
- Bioenergy projects at the local level: Local workforce; Respond to local problems; Relatively low technological risk. BETO is providing Waste-to-Energy technical assistance for local governments. As part of this NREL is assisting with landfill closures. Food waste and municipal wastewater residues were priorities. Additionally, ANL is providing technical assistance for landscape design (managing/repurposing marginal lands/ecosystems services.). Finally, there are also Community LEAP, and Better Buildings programs. ORNL is leading a local and place-based programs in Appalachia, focused on remediation of abandoned land mine sites. The bioeconomy is highly synergistic with CO₂, H₂ and electricity-based economies that will collectively bring the I-WEST region to carbon neutrality. However, there are some noticeable differences 1) Unlike the CO₂, Hydrogen, and electricity economies, the bioeconomy has closer ties to other economic sectors in the region: for example, agriculture, forestry, and recreation. 2) These ties could potentially lead to competition for regional natural resources. 3) Bioeconomy is uniquely vulnerable to impact of a changing climate and related extreme weather events. For these reasons, advancing the bioeconomy in the I-WEST needs to be done in sync, "co-formulated", with the perspectives of local communities. While economics are important, health, environment, quality of life, and traditions also influence the perspectives of local communities towards technology development.

Following the BETO perspectives, the next session was a set of Lightning Talks. The Lightning Talk speakers were a mix of stakeholders in the bioeconomy including, small businesses, university representatives, state government organizations, and non-governmental organizations. The speakers were asked to speak to 2 slides in a set of 10 Lightning talks (5 minutes each). On Slide 1, they were asked to introduce themselves and their organization. On Slide 2, they were asked to provide a couple more specifics on: A) Key technical needs that they envisioned needing over the next 15 years to be successful? B) Community outreach efforts that they have participated in already, or intend to participate in, in the coming years?

The main takeaways from the lightning talks were about integrated systems and distributed on-site processing systems.

- Several of the companies are developing integrated, circular solutions for producing their product (for example, bioenergy or biochar), integrating biomass conversion with agriculture, and even other technologies such as agri-voltaics.
- Several companies are focused on the development of portable, mobile equipment that could be brought to the locations with biomass to enable on-site processing or pre-processing and reduce transportation costs.
- All the companies are engaged in some form of community outreach, through local universities for workforce development, through open houses or through participation in local educational programs.

The Lightning Talks were followed by two roundtable sessions: The first roundtable was focused on technology needs and issues with questions listed in section 1.4 as prompts for discussions. Some of the key messages of the first roundtable session include,

- It is challenging to geologically store CO₂ captured at biomass operations given limited availability of transportation pipelines. The existing pipelines are primarily focused on Enhanced Oil Recovery sector.
- Providing technical assistance to communities affected by closures of coal-fired power plants is crucial, especially those located on tribal lands.
- Converting coal-fired powerplants to biomass co-firing has been suggested to be too expensive, and so companies do not want to co-fire. Local governments are concerned about costs only. How do we get them to value externalities and other value propositions of the bioenergy economy?
- It is necessary to promote distributed models and larger scale deployment of smaller scale systems. These systems offer some unique advantages including savings on transportation costs since smaller systems can be deployed closer to the end-customer.
- Finding cheap sources of CO₂ is critical for making algae-based systems cost competitive given that the commercial sources are \$.06/lb. Cultivation and processing of algae is not proven at the scale comparable to microbrewery scale (1-2 million lbs of processing scale).
- We need to find a way to value the externalities. Usually increasing the scale lowers the cost (by economies of scale). On the other hand, a power-distributed approach, which spreads risk and reward around, can be potentially used in the I-WEST region.
- A cost comparison of 30 micro-plants vs one larger plant needs to be performed to assess the benefits of multiple smaller scale plants deployment and determine whether it helps to achieve typical “economies of scale”. This can be done in the context of bio-char production. A lot of bio-char producers flare off the syn-gas that is co-produced when you make bio-char. Syn-gas could

replace *retail cost* of purchasing conventional natural gas in the community. Economy of scale doesn't get you to the same benefit as helping the local economy. DOE could help more with commercialization of small, distributed systems.

- It is challenging for small businesses to spend time on writing proposals for DOE funding. BETO is aware of this challenge, and it is a priority to improve the access and reduce the complexity of preparing proposals. One potential solution is partnering with a local university.
- Transportation costs for moving woody biomass out of the forest is an issue. This can be overcome by taking pyrolysis units to sites and pre-process the biomass on site. Additionally, the materials can be made easier to retrieve, for example, by converting standing trees to wood chips.
- It would be good to quantify the benefits from circular approaches as well as smaller scale approaches. Economic benefits of "Ecosystem services" are important to quantify but quantifying avoided costs can be challenging. An example of this is quantifying benefits of water retention in soil. In the I-WEST region wind and erosion are a big problem which can be addressed by improving soil water retention ability. Another example is life cycle analyses of forest thinning. "True costs of wildfires" are not quantified. Cost of doing something is the most important; the other benefits of restoration aren't quantified or quantifiable right now.
- Bioeconomy Opportunities is an organization that provides services to local companies who want to grow a business in the bioeconomy.
- The commercial drivers for algae-based systems are not available in the I-WEST region and western US. The 100 acres algae farms will be focused on growing biomass for conversion into nutraceuticals for human consumption. They are still too expensive for conversion into bio-fuels. The costs for algae cultivation farms could be reduced by either distributed systems or integration with wastewater cleanup/ecological services. Integrating trickling filters with algae is less expensive and does not require swapping out to a completely new technology since it builds on a technology that has been deployed. Large open ponds need a certain location either very southern or coastal. Trickling filter plants, old technology that needs updating. CO₂ and ammonia from a syngas system could also be integrated into an algae cultivation system.
- Biomass used for ethanol is important as long as its production does not compete with food (or it becomes first generation). In addition, it will be beneficial to grow the feedstock without a lot of fertilizers and preferably without GMO.

The second roundtable involved community stakeholders and focused on community related issues. Some of the key messages of the second roundtable include,

- The workforce needs of future energy technology could be addressed by working with the local communities/tribal nations to train a workforce in the technology.
- Empowering local communities to come with their own solutions.
- Need to establish trust and build relationships with tribal communities. "Outreach" is not strong enough a word. Relationship building, human-to-human interactions are important with non-tribal and tribal communities. It is not enough just to give a presentation but long-term investment in the community is needed. TheoryYou (MIT) is an example of how to do this.
- Developing partnerships during Covid time has been difficult. Building relationships helps build respect between the researcher /technology owner and the community but it takes time and requires patience. It is important to continuously update the community (not just go in in the beginning, and then at the end). Past researchers have broken trust it is important to be

transparent. Mining, oil production, pipelines all impact indigenous communities. Some good practices to facilitate dialogue include open mic sessions are helpful, to get people to speak up.

- East Africa/Rift valley and other parts of the world have a rich tradition of working with their indigenous communities. It will be helpful to use examples from outside of energy sector. A good example of this is Eco-tourism where the tourism industry collaborated with local people to set up the business including returning profits to the communities. Another example is women's collectives with distributed democracies. Another suggested approach was to have a project that local citizens can be involved in. An example of this is riparian restoration inspired by Civilian Climate Corps idea. Forming a grass roots CCC rather than one formed by the US Forest Service. Working with local conservation districts can help to improve business owner's understanding of access to biomass resources (for example, forest biomass) and waste resources as well as local needs such as needs for water recovery. Second example is installing boilers for bio-char in greenhouses for food sustainability, e.g. Boulder, CO Urban Drawdown Initiative. Third example is greenhouses combined with aquaculture such as the ones installed in Cleveland, Detroit; Gallup and Silver City.
- Long-term commitment to the community and being open to the community needs is important. An example is Common Land, a Dutch NGO, which thinks in term of a 20-year commitment to develop a circular economy in the community "from the ground up-literally".
- Soil-related technologies are old technologies. Learn from native communities about how they value the natural world, have a relationship with the natural world (non-human relatives); instead of exploiting nature; thinking of it as a "resource" for us to use only.
- Work with local communities to develop workforce. Collaborate with local universities (who can provide training), as well as local manufacturers, local municipalities (especially when it comes to waste materials), prison system and other states as needed. Work with local community colleges to get new curriculum related to agriculture (e.g., organic farming, other new practices).
- Try to raise funds from local investors rather than going to the Wall Street.
- Create a co-op to help engage young new farmers. Increase awareness of careers in modern agriculture through STEM education activities to prepare new generation as the farmers are getting old (in 60s). Create jobs for people who need them.

Bioeconomy Workshop Flyer