



# Project 001(D) Alternative Jet Fuel Supply Chain Analysis

## The Pennsylvania State University

### Project Lead Investigator

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### Other Lead Personnel

- Kristin Brandt- WSU
- Tim Rials - UT, Burt English - UT
- Lara Fowler - PSU
- Gabrielle Gilbeau - PSU

### University Participants

#### The Pennsylvania State University

- Other researchers: Lara Fowler - PSU, Gabrielle Gilbeau - PSU
- FAA Award Number: FAA Cooperative Agreement No. 13-C-AJFE-PSU, Amendment 028
- Period of Performance: October 1, 2017 - September 30, 2018

### Project Funding Level

FAA Funding: \$200,000.  
Matching: Penn State - \$200,000  
Total Funding: \$400,000

### Investigation Team

- 1.3.1 **(Lead: Bansal; supported by Brandt, and English)** - Risk-reward profit sharing modeling for first facilities
- 1.3.2 **(Lead: Bansal; supported by Brandt, and English)** - Additional quantification of risk and uncertainties in supply chains (foundational part of task above)
- 1.3.3 **(Lead: Bansal; supported by Brandt, and English)** - Supply chain risk analysis tools for farmer adoption
- 1.4.1 **(Lead: Fowler; supported by Gilbeau)** - National survey of current and proposed state and federal programs that monetize ecosystem services
- 1.4.3 **(Lead: Fowler; supported by Gilbeau)** - Help support stakeholder engagement efforts



## Project Overview

### Task 1.3.1-Risk-Reward Profit Sharing Modeling for First Facilities

Pennsylvania State University

#### **Objective(s)**

Develop a transparent risk-sharing tool to provide an understanding of cash flows and risks faced by all supply chain partners, to all partners.

#### **Research Approach**

We first collected a large number of risk sharing tools that have been proposed in the supply chain literature. Subsequently, we narrowed down the list of 9-12 mechanisms. We created an Excel-based framework in which the cash flows of all supply chain partners are modeled, using the numbers from the TEA analyses developed by WSU. This framework incorporates the risk sharing mechanisms.

#### **Milestone(s)**

Developed the prototype Excel model, in collaborations with the TEA models from WSU.

#### **Major Accomplishments**

We have the Excel tool ready to be used with some guidelines that explain the use of the tool.

#### **Publications**

We anticipate publishing a paper based on combined work from the last year and the coming year.

#### **Outreach Efforts**

The tool has been discussed at three avenues at the ASCENT enterprise.

#### **Awards**

None

#### **Student Involvement**

None

#### **Plans for Next Period**

We intend to run some focus group and laboratory studies to quantify the expected benefit from the tool. We will also develop a video that provide guidelines on using the tool.

#### **References**

None

### Task 1.3.2- Additional Quantification of Risk and Uncertainties in Supply Chains (foundational part of task above)

Pennsylvania State University

#### **Objective(s)**

Develop methods to rely on expert judgments to quantify uncertainties associated with biofuel supply chains.

#### **Research Approach**

We developed a new econometric approach to quantify probability distributions of uncertain quantities such as yield or demand when a panel of experts provide judgments for the most likely values. This approach exploits the well-known

theory of generalized least squares in statistics, for the context in which historical data are available to calibrate expert judgments or when these data are not available.

**Milestone(s)**

We have captured the method in two manuscripts. One of them is finished and submitted for peer review while the second one is in progress.

**Major Accomplishments**

Theoretical development and numerical study shows the promise of this approach.

**Publications**

One paper is under review. The second manuscript will be finished in a few months.

**Outreach Efforts**

None

**Awards**

None

**Student Involvement**

None

**Plans for Next Period**

The second paper will be finished. Any revisions required for the first paper will also be made in the next one-two years.

**References**

None

## **Task 1.3.3- Supply Chain Risk Analysis Tools for Farmer Adoption**

Pennsylvania State University

**Objective(s)**

Understand farmers' risk preferences over a long duration and how it impacts their decisions to adopt crops that can support AJF supply chains.

**Research Approach**

The research is in two parts: (i) survey farmers to understand their risk preferences over extended durations and (ii) use this information as an input to prescriptive models.

**Milestone(s)**

We have initiated conversation with farmers to develop an understanding for (i) above.

**Major Accomplishments**

Our work thus far suggests that farmers do indeed plan for long term and they have other objectives beyond monetary returns. In a set of interactions with farmers with Centre County in Pennsylvania, we found that farmers value a stability in cash flows over 5-10 years, keeping land within the family for the next generation, and environmental issues that may impact their next generation's ownership of land. We plan on continuing this work during the coming year.

**Publications**

None



### **Outreach Efforts**

None

### **Awards**

None

### **Student Involvement**

None

### **Plans for Next Period**

The work for this objective is expected to continue in the coming year as we talk to more farmers and understand their decisions for crop adoption.

### **References**

None

## **Task 1.4.1- National Survey of Current and Proposed State and Federal Programs that Monetize Ecosystem Services**

Pennsylvania State University

### **Objective(s)**

Conduct a survey and summarize current and proposed state and federal programs to monetize economic systems.

### **Research Approach**

This task builds on and continues the work done under ASCENT Project 01, Task 8.1, that focused on the biomass and water quality benefits to the Chesapeake Bay watershed. Under this task, we examined the biofuel law and policy landscape of the Pacific Northwest and Southeast regions, as well as the state of Hawaii. We also researched federal biofuel law and policy.

### **Milestone(s)**

We have captured this research in three regional white papers describing the biofuel law and policy incentives, and the ecosystem services drivers for the sub-regions defined by:

- Project 01A, Tasks 3.1, the Pacific Northwest
- Project 01B, Task 3.2, Hawaii
- Project 01E, the Southeast

### **Major Accomplishments**

We have captured this research in three regional white papers describing the biofuel law and policy incentives, and the ecosystem services drivers for the sub-regions described in the Milestones section above.

### **Publications**

The white papers will be published in the upcoming ASCENT funding year.

### **Outreach Efforts**

Economic model to motivate land use conversion has been demonstrated at CAAFI meetings. In addition, we have provided presentations and posters at several meetings, including the following.

- Presentation by Lara B. Fowler, Gaby Gilbeau: U.S. Biofuel Law & Policy: Biomass Production + Ecosystem Services= Support for the Biofuel Industry? MABEX Annual Conference, University Park, PA (Sept. 13, 2017)



- Poster by Gaby Gilbeau, Lara B. Fowler, U.S. Biofuel Law & Policy: Biomass Production, Water Quality, and Support for the Biofuel Industry, MABEX Annual Conference, University Park, PA (Sept. 2017).
- Presentation by Gaby Gilbeau, Lara B. Fowler, Nationwide Environmental Services Assessment, ASCENT Team Webinar (Nov. 2017).
- Presentation by Kate Zipp: Analysis of ecosystem service valuation, law and policy drivers, and potential policy design of water quality improvements associated with perennial grasses and cover crops, ASCENT Project Meeting, Boston, MA (April 2018).
- Presentation by Lara Fowler, Gaby Gilbeau: The Legal & Regulatory Landscape of the Biofuels Industry, ASCENT Fall Meeting, Alexandria, VA (Oct. 9, 2018)
- Poster by Gaby Gilbeau and Lara Fowler, Biofuel Law & Policy: The Legal & Regulatory Landscape of the Biofuels Industry, CAAFI Fall Meeting, Alexandria, VA (Dec. 2018)

### **Awards**

None

### **Student Involvement**

None

### **Plans for Next Period**

The research moving forward in the next two years will expand upon these regional and national overviews to explore law and policy drivers in additional regions of interest for the ASCENT program, a more in-depth national examination, and expansion of the research beyond water, looking at other environmental service and credit-trading markets. This will help support work identified by other ASCENT team members.

### **References**

None

## **Task 1.4.3- Help Support Stakeholder Engagement Efforts**

Pennsylvania State University

### **Objective(s)**

Facilitate dialogue between producers, industry, government, and other affected stakeholders.

### **Research Approach**

Our work under this objective focused on stakeholder engagement and facilitation of effective dialogue to help bridge the gap between producers, industry, government, and other affected stakeholders. Our work under Objective 1.4.3 included a "Stakeholder Engagement 101" training session for the ASCENT 01 project team members.

### **Milestone(s)**

These efforts supported the stakeholder engagement efforts led by other teams, including but not limited to the regional partners identified in ASCENT Project 01, Tasks 3.1, 3.2 and 3.3.

### **Major Accomplishments**

We provided a stakeholder engagement presentation for ASCENT partners during a regularly scheduled team meeting on April 30, 2018.

In addition, we have held initial conversations with partners in Tennessee but these have been delayed due to constraints for the Tennessee partners.



## **Publications**

None

## **Outreach Efforts**

Economic model to motivate land use conversion has been demonstrated at CAAFI meetings.

## **Awards**

None

## **Student Involvement**

None

## **Plans for Next Period**

Future work on this task involves identifying potential stakeholders and developing guidelines for facilitate discussion among various stakeholders using the model developed in Task 1.3.1. This work will also help support regional analyses under D6. Work going forward under this objective includes presenting to the project partners on facilitation skills and tactics. Additional support for regional projects will be offered as needed, for facilitation and stakeholder engagement sessions as the regional projects move to the deployment stage.

## **References**

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