

Risk-sharing Tool for Alternative Jet Fuel Supply Chains

Motivation and Objectives

Development of a transparent pro-forma decision support tool to promote supply chains for Alternative Jet Fuel (AJF).

- AJF supply chains have multiple partners (e.g., farmers, pre-processors, refineries, airlines) who individually do not understand the business challenges faced by others.
- Perception that other supply chain partners may benefit at their expense is an obstacle in AJF supply chains taking off.
- An Excel based pro-forma that provides cash flows of all supply chain partners can lead to:
 - A lower risk for all partners by understanding the constraints, bottlenecks, and risks in the supply chain.
 - A faster pace of establishment of AJF supply chains.

Methods and Materials

Agents (and material flow)

- Farmers → Crusher unit → refinery → airline
- End-to-end scope, with a focus on elements unique to AJF supply chain.

Pro-forma cash flows

- UTK cash flow models for farmers.
- WSU Techno-economic analyses (TEAs) for crusher and refinery.
- Current feedstock focus is oil seeds; tool can be used with other feedstocks.
- Planning horizon of 20 years.

Methods and Materials (cont'd)

Risk sharing mechanisms:

Grower:

Recipient of	Details
Input cost support	Monetary support per acre
Minimum price guarantee	Minimum price for biomass (kicks in only if the prevailing price is lower)
Minimum quantity guarantee	Minimum quantity bought by crusher (determined by crusher capacity)
Revenue from surplus	Value from produce sold elsewhere

Crusher:

Recipient of	Details
Input/capital cost support	Monetary support based on capacity
Minimum price guarantee	Minimum price for crushed biomass (if the prevailing price is lower)
Minimum quantity purchase guarantee	Minimum/maximum quantity bought by refinery (crusher and refinery will have sync capacities)

Provider of	Details
Price guarantee to grower	Promises to partially cover the gap between biomass price and prevailing market price.

Refinery:

Recipient of	Details
Input/capital cost support	Monetary support based on capacity
Operations costs	Monetary support based on capacity
Minimum price/purchase quantity guarantee	Price at which airline will buy a minimum amount (if fossil fuel price is lower)

Provider of	Details
Price guarantee to crusher	Promises to partially cover the gap between the crushed biomass price and prevailing market price.

Airline:

Recipient of	Details
Price gap guarantee	Receives amount to cover the gap (partially) between AJF price and fossil fuel price

Provider of	Details
Price guarantee to refinery	Promises to partially cover the gap between the AJF price and fossil fuel price.

Next steps

- Pilot the tool with focus groups to test its effectiveness.
- Run lab experiments to quantify the potential benefit.

Three-step Decision Support Tool

1. Step 1: Choose supply chain configuration

CONFIGURATION	
GROWERS' ACRES	150,000
PRE-PROCESSOR CAPACITY (MT)	686,142
REFINERY CAPACITY (MT)	234,784

2. Configure risk-sharing mechanisms in dashboard

Grower (Per Acre)	Y/N	Year -3	Year -2	Year -1	Year 1	Year 2	Year 3	Year 4	Year 5
Receives Input Cost Support Per Acre	No				\$125	\$100	\$20	\$20	\$20
Receives Minimum Price Guarantee?	No				\$0	\$70	\$60	\$60	\$60
Crusher									
Has Minimum Volume Guarantee?	No				100	100	100	100	100
Has Minimum Price Guarantee?	No				\$290	\$290	\$290	\$290	\$290
Refinery									
Assets and Operations Help	Yes				\$125,000	\$110,000	\$110,000	\$110,000	\$110,000
Receives Minimum Purchase Quantity Guarantee from Airline	No				10000	10000	4000	4000	4000
Has Minimum Quantity of Raw Material Guarantee?	No				3000	3000	3000	3000	3000
Asset Cost (No Help)					\$120,000	\$120,000	\$120,000	\$120,000	\$120,000
Operations Cost (No Help)					\$5,000	\$5,000	\$5,000	\$5,000	\$5,000
Airline									
Receives Percentage Price Gap Guarantee?	No				0%	90%	50%	40%	30%
Promises to buy Minimum Quantity ?	No				10000	10000	4000	4000	4000
Government									

3. Sample output to support discussion

