Feedstocks: Developing a Successful Plan and Attracting Investors to Your Biofuels Project

Biofuels Digest
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Biofuel Financing - Feedstocks

Introduction

Feedstock Risk

Objectives

Plan & Structure

Align feedstock supply, process technology, project structure, and operations to create financial success!

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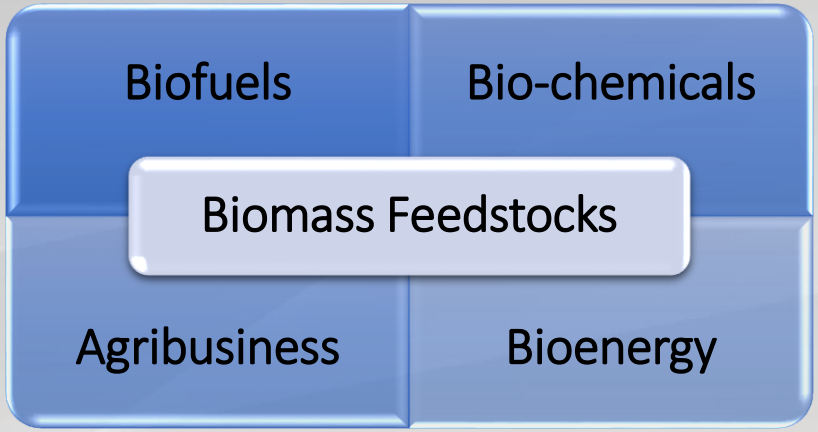
Bio-conversion & Agribusiness Consulting

- **Biomass Supply Chain Development**
- **Biofuel Project Development**
- **Financial Validation**
- **Feasibility Studies**
- **Market Analysis**
- **Economic Impact Analysis**
- **Due Diligence for Financing**



Providing experienced advice, exceptional analytics and strategic development for the bio-conversion and agribusiness industry.

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1. Risk in the Supply Chain

There is typically RISK in many biomass projects regarding:

- Feedstock yield
- Feedstock quality & composition
- Feedstock delivery – quantity and schedule
- Project timeline – plant startup and feedstock scale up
- Process technology capabilities
- Plant operations
- Financing Risk
- Risk Management needs to be integrated into Operations

Establish a comprehensive Strategy that addresses these risks for your project to expand your opportunity for success.

Supply Chain is an Agricultural System

- Agricultural systems are biological, subject to risk from disease, weather, insects/pests, and other factors
- There will be year-to-year variability in cost due to these factors
  - Can lead to plant shutdown
  - Inventory is one option to mitigate
  - Secondary crop is another option to help

Develop a plan that helps to address these risks, re-evaluate as new information is gathered

What are the Risks?

= Failure to Operate!

Feedstock Supply Chain Costs:

Feedstock Annual Cost	Starch	Cellulose
Plant Size	30 MMGY	30 MMGY
Unit Cost	$4.00 per bushel	$80 per US ton
Conversion Yield	2.80 gallons/bu	75.00 gallons/ton
% of Total Costs	75%	50%
Cost in $ per Gallon	$1.43	$1.07
Cost in $ per Liter	$0.38	$0.28
Total Cost per Year	$42,857,143	$32,000,000

Feedstock is the leading cost in most biorefineries – is the supply chain setup for success?

Risk for Biofuel Projects: Feedstock is Critical to Success

Biomass Feedstock:

- Required to Operate
- 40 – 80% of the cost of production

400,000 dry ton/ 30 MMGY CE

- $108 MM Revenue per Year
- $300,000 Revenues per day

10% change in feedstock at $80/dry ton is $0.10 per gallon on a 30 MMGY plant = $3,000,000 per year

If a biomass supply chain is not developed and managed appropriately, it can cause severe disruptions in operations and result in massive financial losses.

Feedstock Risk in 1st Gen Biofuels

- 1st Gen corn ethanol industry - Feedstock supply risk was a concern…more so in the early-stages
  - 1990's – many ethanol plants included requirements for farmer integration in biofuel and feedstock delivery (coops, NCG structures) to mitigate the financing risk of short feedstock supply
  - 2000's – banks found comfort with 3rd party originators for feedstock
  - Today most corn ethanol plants are financed with on existing corn feedstocks – availability and economics are usually determined as commodity
  - Commodity risk – price of corn may not trade inline with ethanol

Crop Residue Supply Chain

Direct Harvest

Grain Harvest

Stored Biomass

Residue Harvest
- Cut/Windrow
- Bale
- Stack

Transport
- Load
- Transport

Storage
- Unload
- Stack

Delivery
- Transport
- Unload

Biorefinery





Feedstock Risk in 2nd Gen Biofuels

- 2nd Generation fuels are evaluating new feedstocks
  - Cellulosic crops like switchgrass, miscanthus, new oil crops, plus crop residues
  - Feedstocks may not widely available today – not a commodity
  - Feedstocks have risk with development, inventory, cost, quality, and delivery
  - Some feedstocks offer opportunity for longer term contracts to mitigate cross commodity price risk of 1st Gen biofuels like corn and wheat

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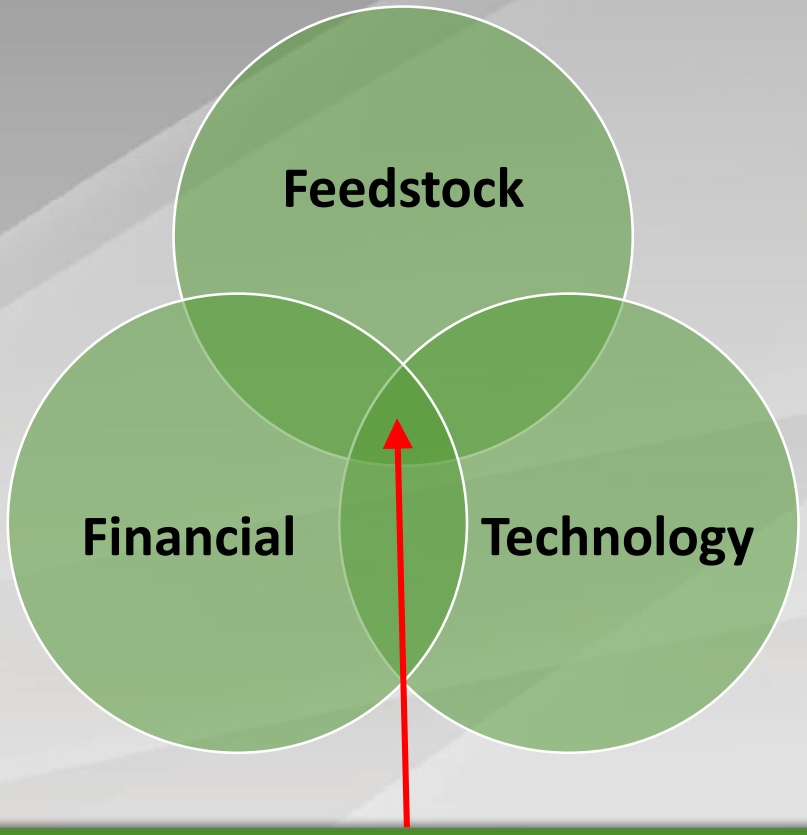
2. Feedstock Objectives



Successful projects mitigate risk in these 3 areas by developing an economic and environmentally sustainable Feedstock Supply Chain

Supply Chain Objectives

Develop & operate economically competitive and sustainable Feedstock Supply Chains

Quality
Cost
Delivery

Bio-conversion operations must be capable of mitigating and managing risk in each of these categories

Supply Chain Objectives

QCD

1. Quality
2. Cost
3. Delivery
   - Quantity
   - Schedule

Example:

Our process economics are optimized and can operate sustainably using a:

- Herbaceous feedstock at < 60% moisture with under 5% acids
- < $80 per dry ton at 55% carbohydrates
- Using existing collection methods delivered year-round at 2000 dry tons per day.
- Can be achieved with high regard to safety and morale for internal team, partners, and external stakeholders.

Feedstock Quality

- Carbohydrate
- Energy Content/BTUs
- Moisture
- Dirt
- Other contaminants
- Ash
- Lignin
- Inhibitors
- Artifacts from Storage

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Feedstock Cost Analysis

- Feedstock(s)
- Cost of Production
  - Land Rental
  - Establishment
  - Crop Growth & Production
  - Harvest
  - Transportation
  - Storage
  - Delivery
- Crop Yields
- Inventory

- Startup Costs
  - Working capital
  - Assets
- Competing Markets
- Variability in Feedstock and Plant Operations

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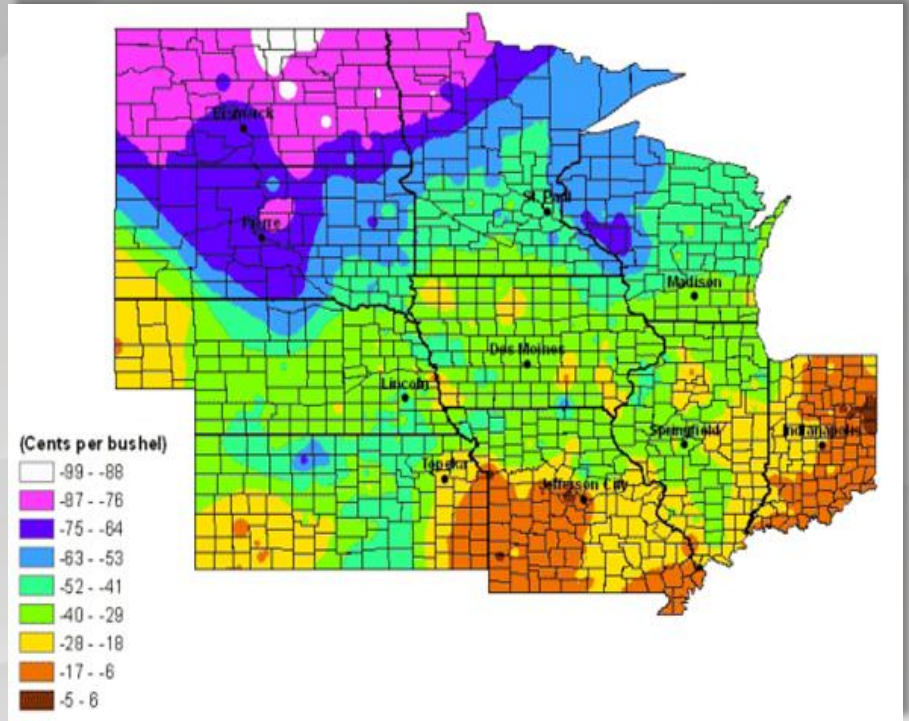
How Competitive is Your Feedstock?

- Land Rental
- Establishment Costs
- Cost of Production
- Harvesting
- Transportation
- Storage
- Crop Yields



$0.10 per gallon on 100 MMGY plant is $10,000,000 per year

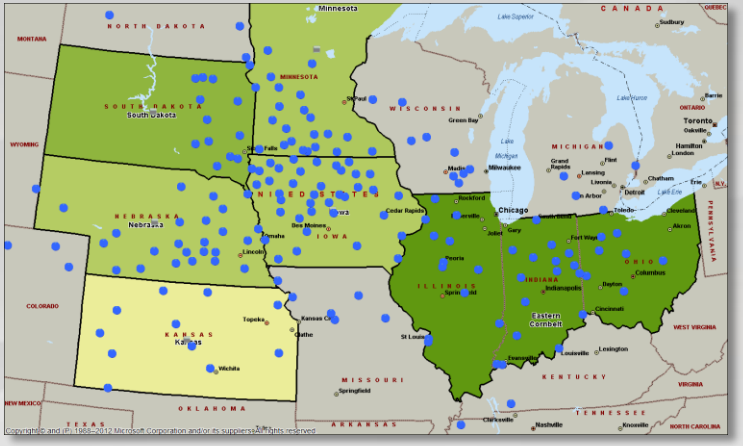
Projects may have 10-30 Year Fixed Assets – how will markets change?

Feedstock Impacts Crush Margins

The location of a bio-conversion project has major implications on its feedstock price, end-product pricing, transportation costs and crush margin

- Crush margin analysis of US Corn Ethanol industry reveals the critical importance that location can have on feedstock cost*

Time Period	Iowa	South Dakota	Kansas
2014	$0.99	$1.09	$0.91
2013	$0.68	$0.76	$0.62
2012	$0.35	$0.42	$0.40
2011	$0.66	$0.67	$0.67
2010	$0.55	$0.62	$0.49

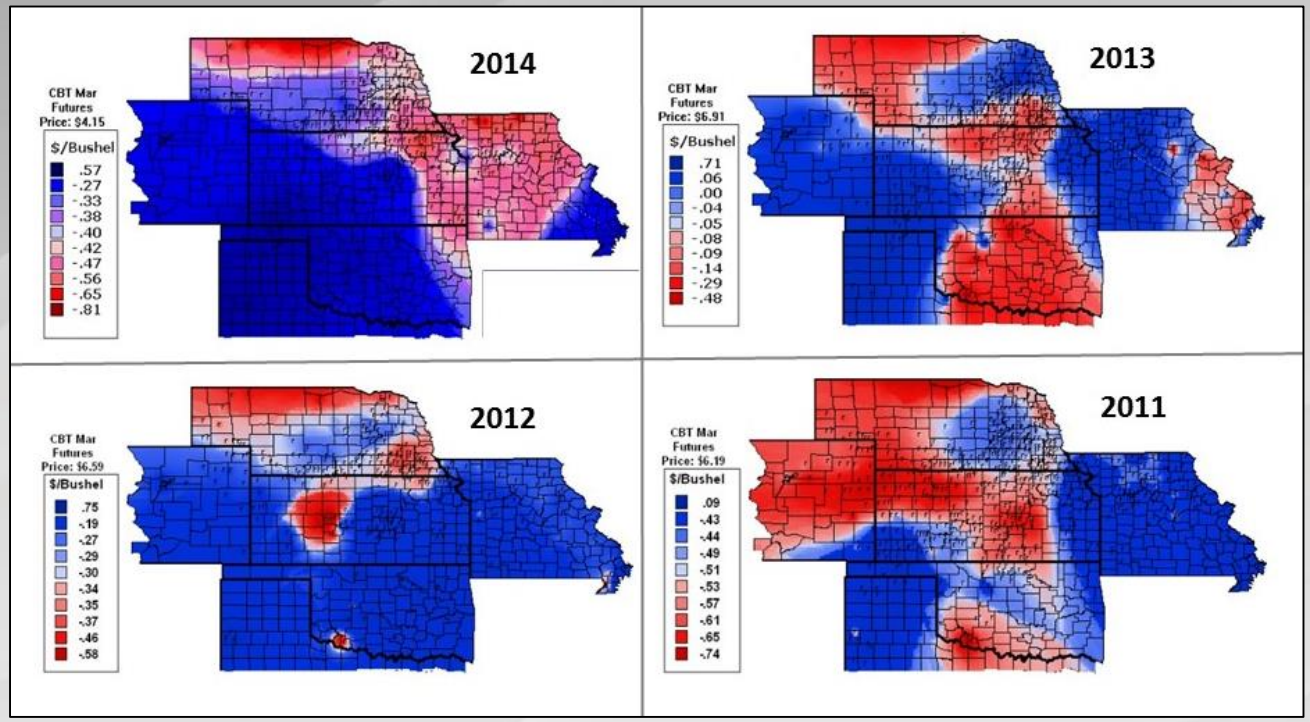


$0.10 per gallon on 100 MMGY plant is $10,000,000 per year

* Average crush margins calculation – actual margins dependent on location, markets, technology, management, operations

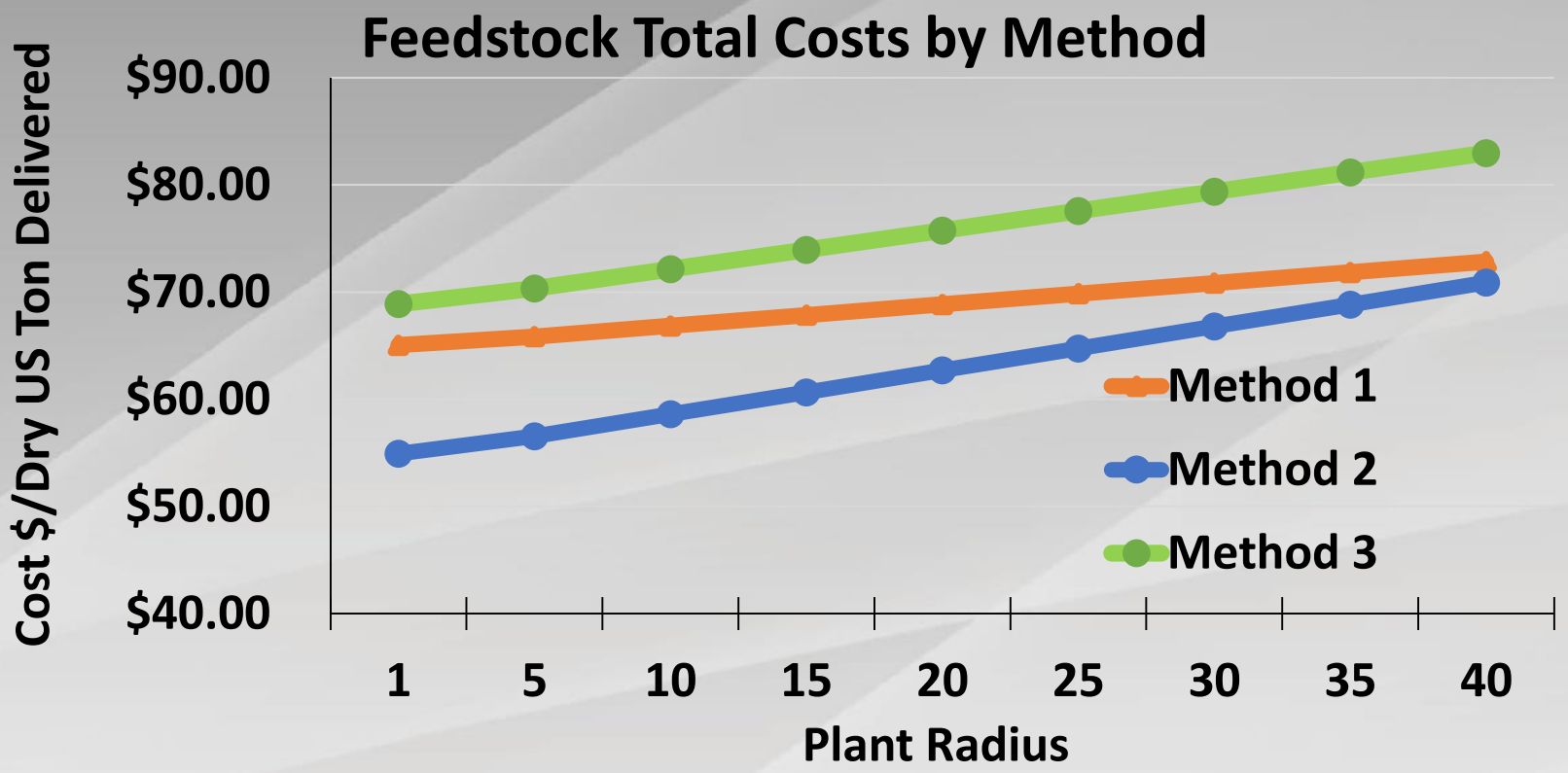
Feedstock Price and Supply

Pricing of commodities in a specific region changes over time based on production and demand



One Year does not establish the Baseline

What Feedstock is Least Cost?



The answer depends on several factors - whether supply chain can harvest directly or requires storage, and what distance the land is available by each crop

Why create Supply Chain Models?

- Create a framework for evaluating strategies for timelines, budget, and goals within project development
- Evaluate business scenarios to optimize the operations
- Financial representation to management, investors and debt providers
- Understanding of key drivers to financial returns & risk
- Assist in decision making for Board and Management
- Sensitivity analysis can identify potential risks and actions to consider

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Feedstock Delivery/Supply

- Evaluate local and regional potential
  - Existing availability
    - Historical changes
  - Potential availability
    - Resources required
- Develop assurance for long term supply
  - Contract direct with farmers, harvesters, and/or coop
  - Vertically integrate upstream in the supply chain
  - Partnerships

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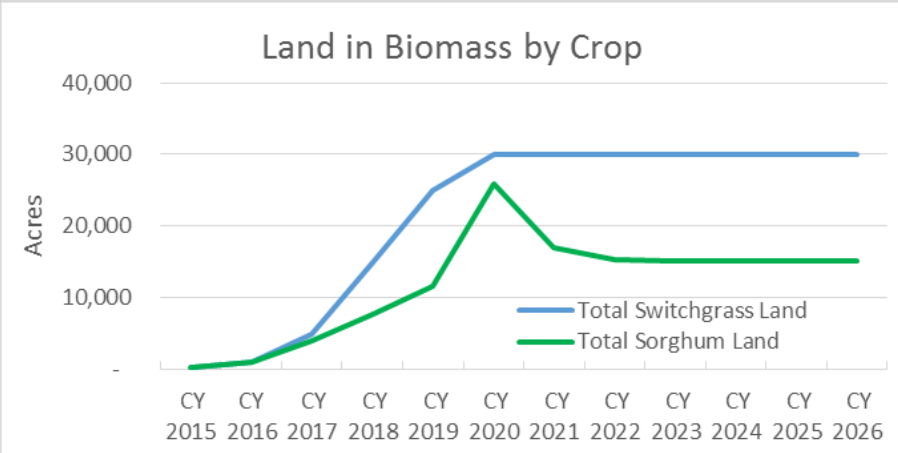
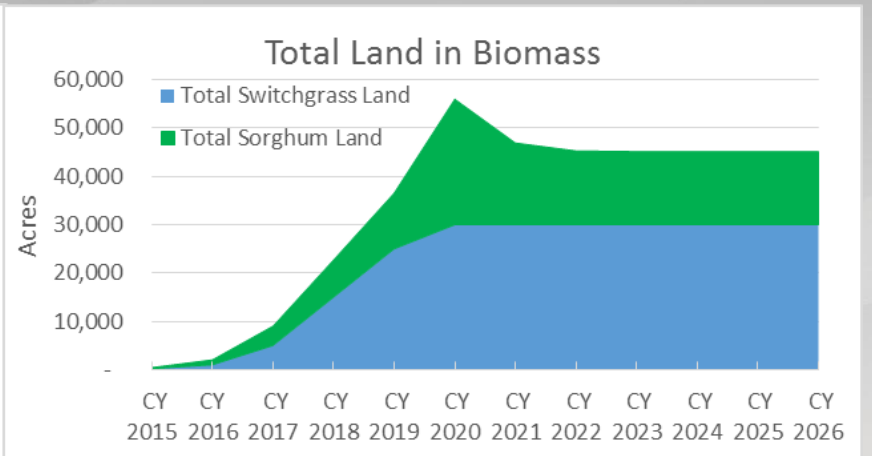
Feedstock Supply Chain Volumes

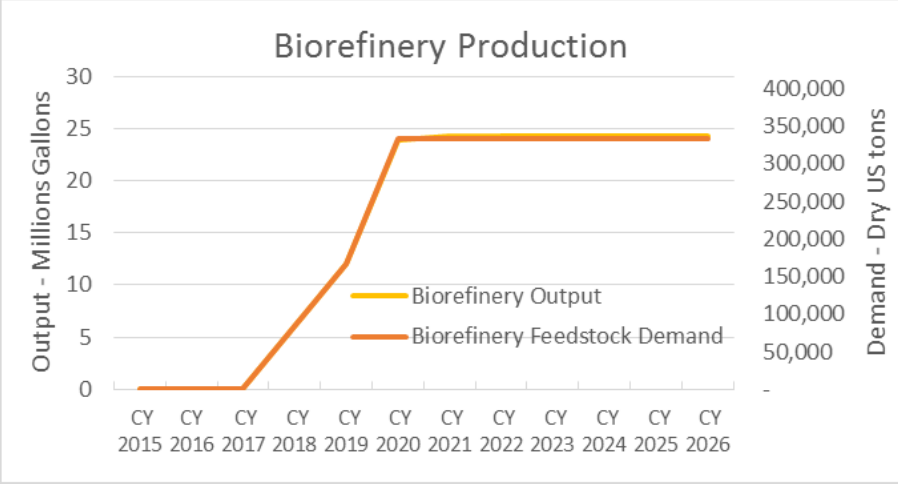
Biorefinery Volumes	US	Metric
Biorefinery Output Size	**30 Million gallons**	**114 Million liters**
Equivalent Size	714,286 barrels	89,635 Metric tons
Corn Grain		
Corn Starch Feedstock	10,909,000 bushels	277,000 Metric tons
Corn Starch Land	72,727 acres	73,000 hectares
Cellulosic Feedstock		
Cellulose Feedstock Size	400,000 dry US tons	362,878 metric tons
Dedicated Energy Crops	**57,000 acres**	**23,000 hectares**
Crop Residues	**200,000 acres**	**81,000 hectares**
Truckloads to Plant per Year	**19,000 truckloads**	
Bales per Year	**728,000 bales**	

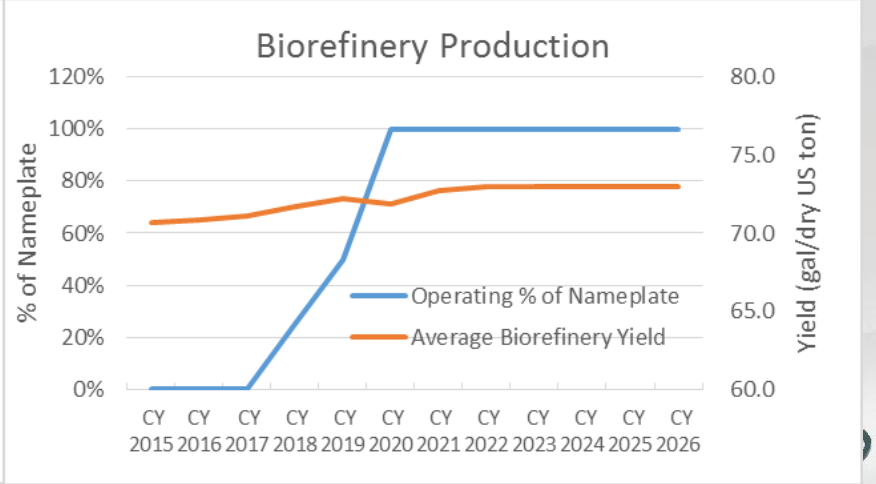
The supply chain does not appear overnight, and it requires continual optimization once operational

Performance & Benchmarking









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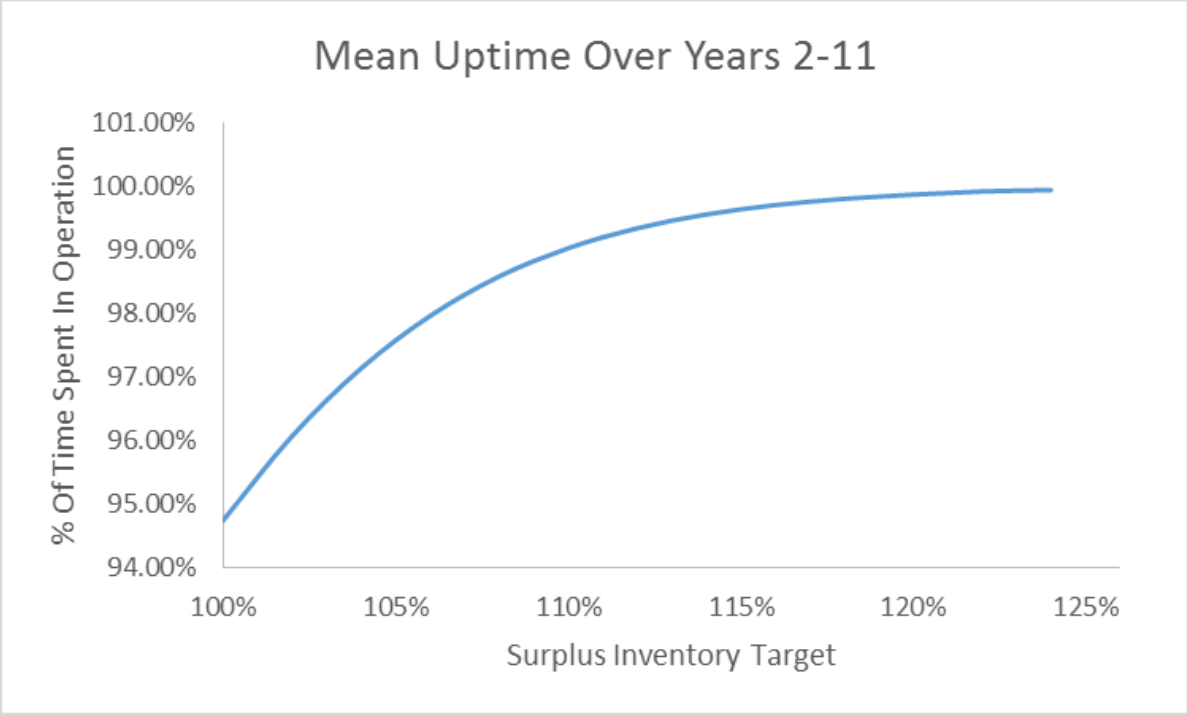
Risk Assessment & Mitigation

- Integrate Risk Assessment and Mitigation into the Strategy
- Example: Examine options to implement multi-crop strategy to manage inventory on a yearly basis



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3. Supply Chain Plan & Strategy

- Integrate the supply chain objectives into a coordinated plan and strategy for feedstock supply chain to operate while managing risk
- Use structure(s) that will enable the feedstock supply chain to deliver on the project goals:
  - Business Structure (vertical integration, coops, farmer model)
  - Capital Structure (leasing equipment, rental, ownership)
  - Operational Structure (supplier performance requirements)

What is required in the Strategy?

Strategy for development should address:

- Feedstock yield
- Feedstock quality and composition
- Feedstock delivery – quantity and schedule
- Project timeline – plant startup and feedstock scale up
- Process technology capabilities
- Plant operations
- Financing Risk
- Risk Management

Establish a comprehensive Strategy that addresses these risks for your project to expand your opportunity for success.

Feedstock – What is the plan?

Who will delivery feedstock?

What is the cost of feedstock?

What feedstock will the project accept?

Where will the feedstock come from?

Where is feedstock stored?

Who will buy the equipment to collect?

When is feedstock harvested?

Who will produce the feedstock?

How much inventory is needed?

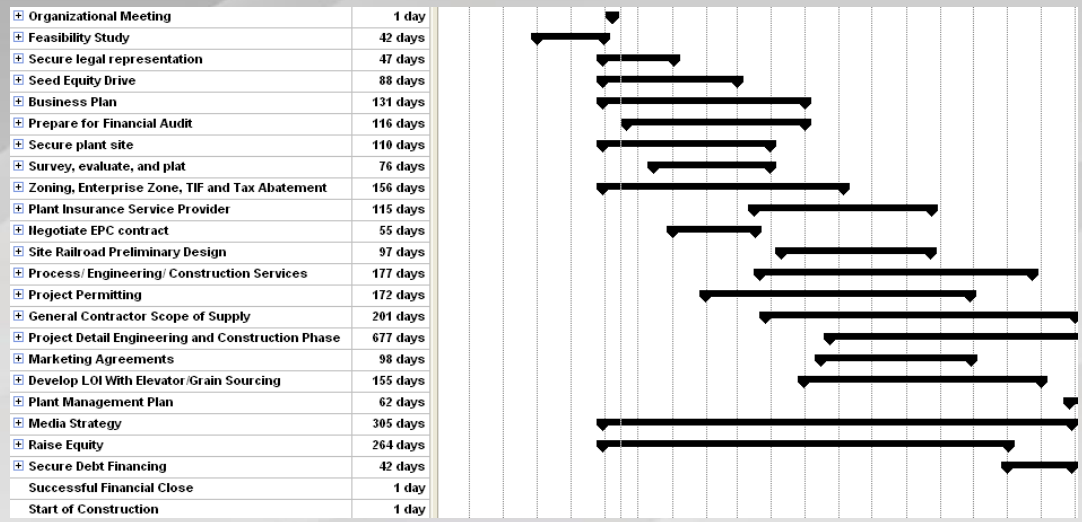
How will risk be mitigated?

How will quality be managed?

Does your project have a Feedstock Plan?

Plan for Plant, Plan for Feedstock

- There are usually detailed plans for Bio-conversion facility development and operation



Organizational Meeting	1 day
Feasibility Study	42 days
Secure legal representation	47 days
Seed Equity Drive	88 days
Business Plan	131 days
Prepare for Financial Audit	116 days
Secure plant site	110 days
Survey, evaluate, and plat	76 days
Zoning, Enterprise Zone, TIF and Tax Abatement	156 days
Plant Insurance Service Provider	115 days
Negotiate EPC contract	55 days
Site Railroad Preliminary Design	97 days
Process/ Engineering/ Construction Services	177 days
Project Permitting	172 days
General Contractor Scope of Supply	201 days
Project Detail Engineering and Construction Phase	677 days
Marketing Agreements	98 days
Develop LOI With Elevator/Grain Sourcing	155 days
Plant Management Plan	62 days
Media Strategy	305 days
Raise Equity	264 days
Secure Debt Financing	42 days
Successful Financial Close	1 day
Start of Construction	1 day

- Has a similar approach been used to properly develop the feedstock supply chain and mitigate its risk?

Feedstock – What is the Plan?

- Project & Location description
- Overview feedstock supply chain
- Feedstock supply availability
- Feedstock Production
- Feedstock Collection
- Feedstock storage
- Feedstock delivery to biorefinery
- Preprocessing
- Operations and Logistics
- Feedstock quality control
- Feedstock supply chain management
- Risk analysis
- Government policy & regulations
- Sustainability
- Project Schedule
- Preliminary cost analysis
- Government incentives
- Financing

Feedstock Supply Chain Strategy is critical to project success

Structuring the Biomass Supply Chain

- Use structure(s) that will enable the feedstock supply chain to deliver on the project goals:
  - Business Structure (vertical integration, coops, farmer model)
  - Capital Structure (leasing equipment, rental, ownership)
  - Operational Structure (supplier performance requirements)

Structuring the Biomass Supply Chain

Establishment | Crop Production | Harvest | Transport | Storage | Delivery

Integration of Supply Chain with Biofuel Facility

Independent Suppliers (farmer model)

Partial ownership/control of supply chain

Vertically integrated supply chain

Integration of the Biomass Supply Chain

- Integration can have several approaches depending on:
  - Objectives of Supply Chain
  - Feedstock Cost
  - Operational Risk
  - Capital Structure of Supply Chain
  - Business ownership structure
- Examples:
  - Capital – equipment & seeds
  - Supply chain management
  - Training – operator & repair
  - Equipment acquisition
  - Seed/rhizome scale up
  - Grower recruitment


THE WALL STREET JOURNAL. ≡ BUSINESS

BUSINESS

Hunger for Organic Foods Stretches Supply Chain

Nature's Path buys cropland, while Chipotle provides financing for farmers

"Companies including soup maker Pacific Foods of Oregon Inc. and publicly traded burrito chain Chipotle Mexican Grill Inc. are digging deeper into the supply chain with such moves as **financing farmers**, offering **technical training** and **hiring full-time headhunters** to recruit organic growers." WSJ – April 6, 2015

Feedstock Supply Requirements

- Feedstock Quality
- Feedstock Price/Cost
- Feedstock Delivery – quantity and schedule
  - Historical and predicted supplies
  - Inventory targets
  - Supply variability – quantity (crop yields) & delivery
  - Replacement cost & availability

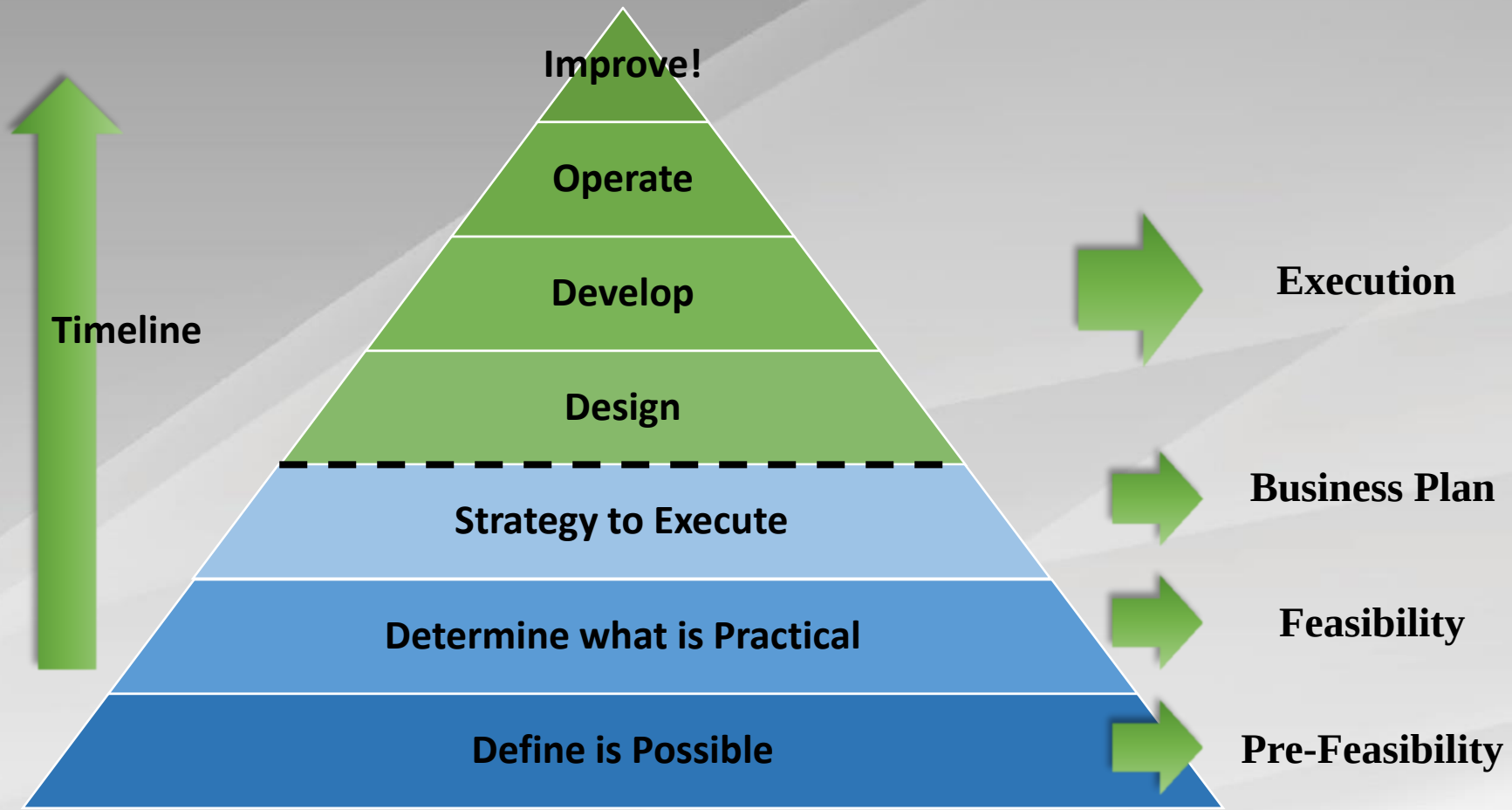
Feedstock Supply Considerations

- Supplier integration with Biofuel project
  - Weigh the Benefits & Costs
  - Land contracts – especially for longer tenure crops
- Performance Capabilities and Guarantee
  - Ability to enforce – legal and reputation
  - Credit Quality of Suppliers
- Assurance for long term supply required
  - Contracts direct with farmers, harvesters, and/or coop
  - Vertically integrate upstream in the supply chain
  - Partnerships
- Term of Contracts for Biofuel Off-take
  - how does it impact Feedstock Supply requirements

Factors that Impact Structure

- Establish structure to address supply and price/cost variability
  - Is the feedstock a Commodity or Specialized Feedstock?
  - Understand the risk of price/cost variability
- Capital Requirements
  - Establishing the Feedstock Supply Chain – equipment, seed stock, startup capital
  - Operating Supply Chain – storage sites, equipment, building, offices, working capital
- Equipment Requirements for supply chain
  - Existing or new equipment?
  - Resale value of equipment – who bears the risk
  - Operating requirements – skill level required
- Plant reproduction (seeds, rhizomes, etc.)
  - Availability of seed stock – scale up timeline
  - Capital Cost – upfront, other ongoing fees
  - Operating Cost – who is responsible
- Operations – crop production, harvesting, transport
  - Existing custom operator models or new approach required
  - New equipment requires skilled operators

Supply Chain Development



Conclusion
Biofuel Feedstocks - Financing

1. Understand the Risk for Financing and Operation
   - 2nd Generation Feedstocks are unique and present different financing risk
2. Define the Objectives – Quality, Cost, Delivery (QCD)
3. Develop Strategy to Address Operating & Financing Risk
   - Structure the Supply Chain to meet Project needs
   - Performance Requirements for Supply Chain embedded in structure
   - Evaluate options beyond just Cost/Price impact – think about the impact on long-term success and risk

Developing a successful Biomass supply chain structure has the potential to make or break the financial outcomes of a project.

Let’s Build a Great Project!

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- Thank You -

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