International Bioenergy Trade

CN-17: Feedstock Supply Production and System Logistics Analysis

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Idaho National Laboratory

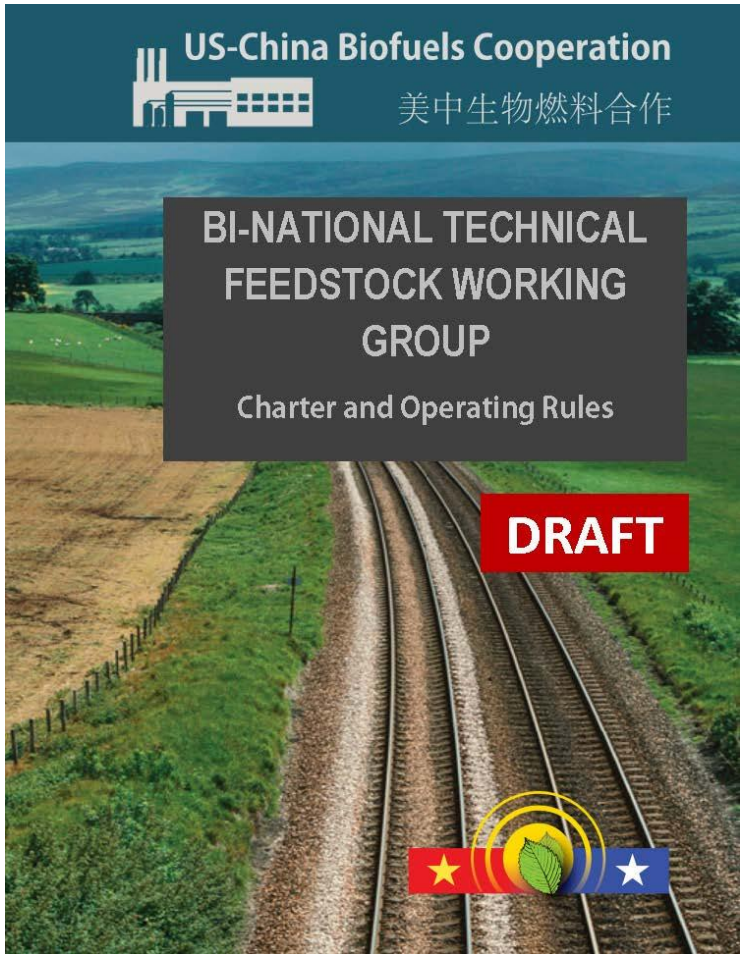
TECHNICAL APPROACH AND DELIVERABLES

- ***17.3.1 Task 1. Complete the establishment of a bi-national technical feedstock working group.***
- ***17.3.2 Task 2. Expand the Chinese supply system base model***
- ***17.3.3 Task 3. Expand the international biomass feedstock trade model***
- ***17.3.4 Task 4. Support US-China biofuels cooperative missions and dissemination of findings***
- ***17.3.5 Task 5. Feasibility analysis of integrating the supply system and international trade models***
- ***17.3.6 Task 6. Develop Residue Removal Protocols***

Bi-National Technical Feedstock Working Group

Working with the Chinese Agricultural University to establish a technical working group

- Members initially from USDA, USDOE, and China's NEA
- Expansion into other U.S. and China government, university, and industry.



Biomass Logistics Model (BLM-SinoFS)

- Preliminary Analysis
  - Delivered feedstock cost $58.43/DMT
  - Energy consumption 221.30 MBTU/DMT

Selected Base Case Run
China

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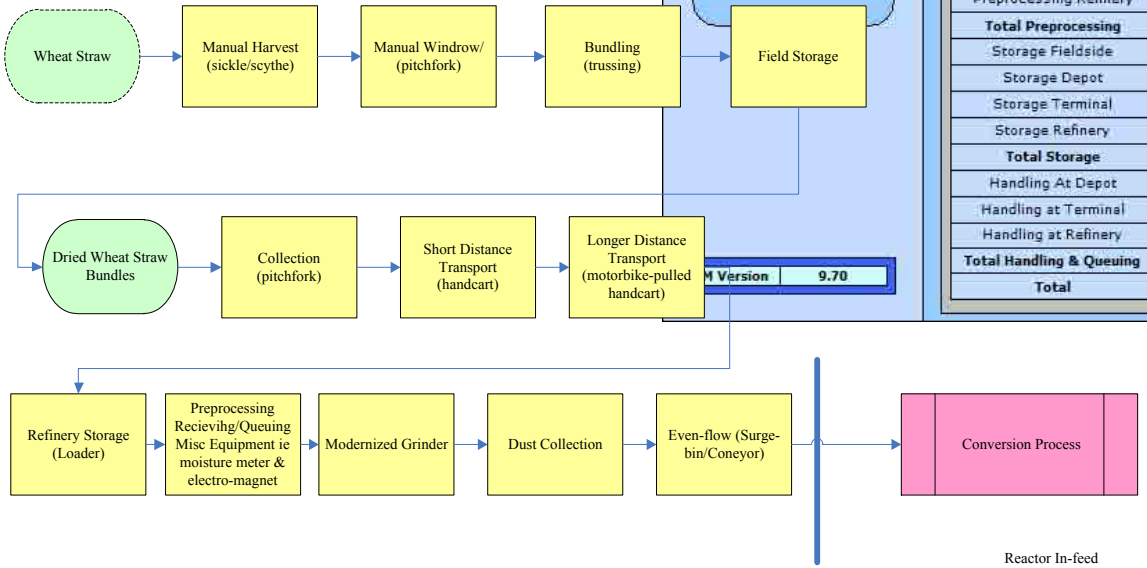
Version 9.70

Cost Summary ($/ DM ton)

	Installed Capital	Ownership	Operating	DM Loss	Total	MBTU (MBTU/ton
Total Grower's Payment					0.00	
Harvesting	2.35	0.08	14.55	0.00	14.63	0.00
Baling/ Bundling	0.76	0.04	7.66	0.00	7.70	0.00
Collection	1.15	0.15	11.55	0.00	11.70	0.00
Total Harvest & Collection	**4.26**	**0.27**	**33.76**	**0.00**	**34.03**	**0.00**
Transportation FROM Field	0.15	6.39e-3	10.04	0.00	10.05	0.00
Transportation FROM Depot	0.74	0.10	1.34	0.00	1.44	40.28
ransportation FROM Termina	0.00	0.00	0.00	0.00	0.00	0.00
Total Transportation	**0.89**	**0.11**	**11.38**	**0.00**	**11.49**	**40.28**
Preprocessing Fieldside	0.00	0.00	0.00	0.00	0.00	0.00
Preprocessing Depot	0.00	0.00	0.00	0.00	0.00	0.00
Preprocessing Terminal	0.00	0.00	0.00	0.00	0.00	0.00
Preprocessing Refinery	5.68	2.09	8.53	0.00	10.62	172.33
Total Preprocessing	**5.68**	**2.09**	**8.53**	**0.00**	**10.62**	**172.33**
Storage Fieldside	0.00	0.00	0.00	1.79	1.79	0.00
Storage Depot	0.00	0.00	0.00	0.00	0.00	0.00
Storage Terminal	0.00	0.00	0.00	0.00	0.00	0.00
Storage Refinery	0.10	0.07	0.29	0.00	0.36	5.49
Total Storage	**0.10**	**0.07**	**0.29**	**1.79**	**2.15**	**5.49**
Handling At Depot	0.00	0.00	0.00	0.00	0.00	0.00
Handling at Terminal	0.00	0.00	0.00	0.00	0.00	0.00
Handling at Refinery	0.73	0.05	0.09	0.00	0.14	3.19
Total Handling & Queuing	**0.73**	**0.05**	**0.09**	**0.00**	**0.14**	**3.19**
Total	**11.65**	**2.58**	**54.06**	**1.79**	**58.43**	**221.30**

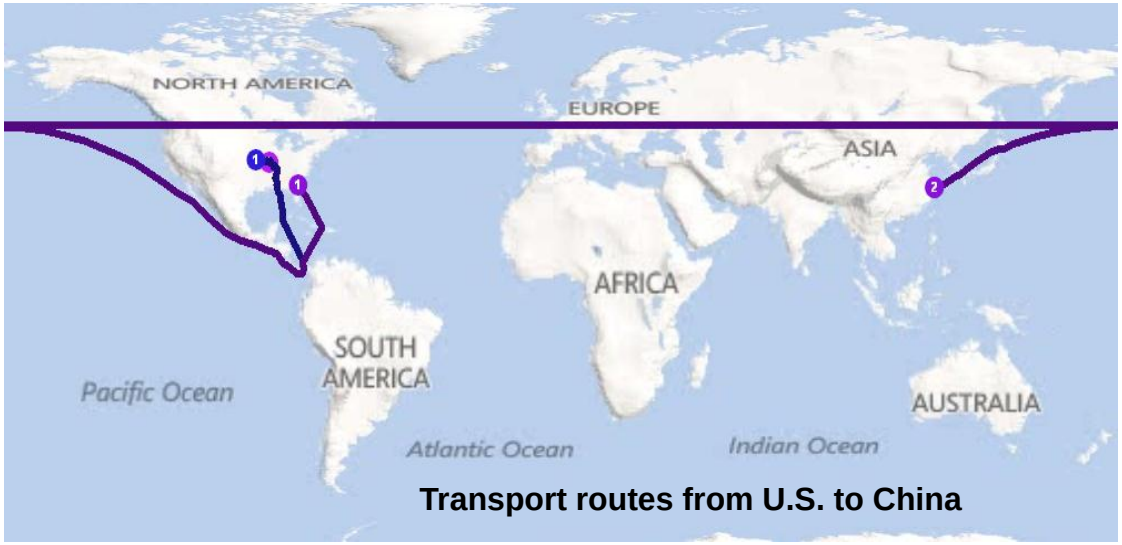


International Feedstock Logistic Supply System

- Tasks
  - Model US logistics costs to deliver a stable, dense biomass to a U.S. port
  - Model shipment of biomass from the US to China
  - Compare several types of biomass and logistic supply systems.

Shipping cost parameters (Deseck and Lams 2011)

TIME CHARTER (U.S.$/DAY)	VOYAGE COST
Depreciations	Fuel Oil
Interest on Capital	Harbor and canal dues
Financial Charges	Loading /Discharging Costs
Insurance of Hull Machinery	Stowage Material
Survey Classification	Cleaning of Holds
Maintenance and Repairs	Damage to Cargo
General Costs	
Stock, Supply Crew	
Lubricating Oil	



Transport routes from U.S. to China

Evaluation of US-to-China Biomass Supply System

Case 1: Savannah to Shanghai

Case 2: Kansas City to Shanghai

Case 3: St. Louis to Shanghai

	CASE 1	CASE 2	CASE 3
Feedstock	Woody thinnings	Corn Stover	Corn Stover
Field-side	Southeast U.S.	Midwest US	Midwest U.S.
Transport to depot	Wood chips, 50 miles by truck	Square bales, 50 miles by truck	Square bales, 50 miles by truck
Depot	Pelletization	Pelletization	Pelletization
Transport to terminal	Pellets, 100 miles by truck	Pellets, 100 miles by truck	Pellets, 100 miles by truck
Terminal	Savannah (GA)	Kansas City (MO)	St Louis (MO)
Long distance international transport	Pellets, long distance intermodal transport	Pellets, long distance intermodal transport	Pellets, long distance intermodal transport
Destination	China (Shanghai)	China (Shanghai)	China (Shanghai)

Preliminary biomass supply system costs for US-to-China Scenarios

Cost Summary ($/DM ton)	Case 1	Case 2	Case 3
Harvesting	$ 8.09	$ 1.94	$ 1.94
Bailing/Bundling	$ 0.00	$ 11.47	$ 11.47
Collection	$ 8.68	$ 1.88	$ 1.88
Total Harvest & Collection	**$ 16.77**	**$ 15.29**	**$ 15.29**
Transport From Field	$ 15.46	$ 10.36	$ 10.36
Transport From Depot	$ 8.49	$ 14.24	$ 14.24
Transport From Terminal	$ 61.95	$ 88.79	$ 90.01
Total Transportation	**$ 85.90**	**$ 113.39**	**$ 114.61**
Preprocessing Field Side	$ 9.17	$ 0.00	$ 0.00
Preprocessing Depot	$ 24.07	$ 15.88	$ 15.88
Total Preprocessing	**$ 33.24**	**$ 15.88**	**$ 15.88**
Storage Field Side	$ 0.17	$ 4.73	$ 4.73
Storage Depot	$ 0.00	$ 0.32	$ 0.32
Storage Refinery	$ 1.74	$ 0.00	$ 0.00
Total Storage	**$ 1.91**	**$ 5.05**	**$ 5.05**
Handling and Queuing Refinery	$ 1.60	$ 0.70	$ 0.70
Total Handling and Queuing	**$ 1.60**	**$ 0.70**	**$ 0.70**
Total	**$ 139.42**	**$ 150.31**	**$ 151.53**