



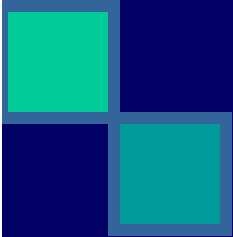

Harvesting Bio-Energy Feedstock Machinery Industry Perspective



CNH America LLC



A Vision for Equipment Manufactures

- 
- Provide equipment for harvesting and collecting consistent quality feedstock for conversion to ...
 - Feed
 - Fiber
 - Food
 - Fuel
- 

Feed for Large Dairy and Feedlot Operations

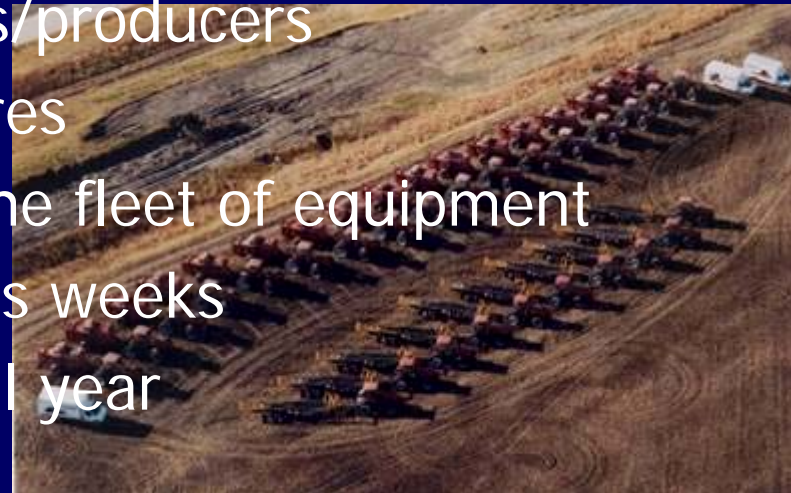
- Custom cutters and feed contracts for cost effective feedstock
- Harvest window is weeks
- Feed utilized year around



Fiber boards from straw

- Dow BioProducts Ltd

- Dow BioProducts manages all logistics of baling operations
- Over 450 farmers/producers
- Over 200,000 acres
- Owns or leases the fleet of equipment
- Harvest window is weeks
- Process time is all year




Sugar Mills (Food)




- 7+ mil tons material from 180k acres in Florida (2003)
- US Sugar in Florida transports feedstock by private rail
- Harvest and process time is 5-6 mo./yr



The South Central Florida Express serves the agricultural transportation needs of the entire Lake Okeechobee agricultural area.



European Combined Heat and Power plants (**Fuel**)

- 65+ straw – fired plants in Denmark
 - 400,000 tonnes of straw/year (mid '90s)
 - Harvest window is weeks
- 



Current Production Harvesting Equipment Platforms

- What is widely available today for harvesting biomass materials?

Large Square Balers

- Primarily harvests and packages dry materials
- Multiple bale sizes and densities
- Continuous operation
- Many options for handling bales



Combines

- Harvesters separate grain from residues
- Provide grain and residue streams
- Flexibility in set-up for harvesting many crops
- “Universal” headers or “Special” headers



Forage Harvesters

- Harvest crops with a wide range of moisture content
- Delivers size reduced feedstock
- High harvesting throughput
- “Universal” headers or “Special” headers






Considerations for Harvesting & Collection Systems

- Common platform equipment
 - Cost effective
 - More flexibility
 - More reliability and available support
 - Specialized equipment
 - Higher costs
 - Less Flexible
 - Less available support
- 




Considerations for Harvesting & Collection Systems

- Storage
 - Impacts equipment choices
 - Impacts delivered quality
 - Material handling important
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Requirements For Dependable Harvest & Collection System

- Part of a total system approach
 - Compatible with other operations (grain harvesting and processing plant).
 - Handle short harvest window (weeks).
 - Preserve quality during storage.
 - Allow efficient material handling.
 - Utilize cost effective transportation.
- 




Harvesting and Collection Equipment Summary

- Most of the needed equipment already exists.
 - Storage will impact equipment choices.
 - Optimal 'crop to processing plant' systems are not yet clear.
 - Acceptable range of quality for feedstock is not yet clear.
- 



Salix Harvester Development

- Base Salix Harvester on a Forage Harvester
 - Big capacity self propelled harvester.
 - Size reduction ranges from 10 to 35 mm LOC.
 - Knife/shearbar cutting is most efficient.
 - Produces a consistent and uniform feedstock
 - “Special” Header required to Cut and Feed Crop into Forage Harvester
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Salix Harvester Development

- Fall 04 Winter 04/05
 - Used New Holland FX45 Forage Harvester
 - Reinforced a production Corn Head



Salix Harvester Development

- Fall 04 Winter 04/05
 - Feeding function good with stems <35mm
 - Feedstock was uniform and consistent
 - Cutting of stems was marginally acceptable
 - Header durability was unacceptable



Salix Harvester Development

- June 05
 - Saw demonstration of CRL coppice head in the UK.
 - Performed a design review on the third generation head.



Salix Harvester Development

- Fall 05 Winter 05/06
 - Procure a third generation prototype coppice head from CRL Ltd.
 - CRL head concept has proven function and durability with 1000 hrs operation in UK

