Evaluating the Advantage of Indexing Loads

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AUBURN, AL

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Alternative Trailer Configurations for Maximizing Payloads

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Outline

Trailer Designs

- Introduction
- High Capacity Chip Trailer
- High Volume Longwood Trailer

Loading Configurations

- Indexing
- Untrimmed (Whole) Trees

Summary

Trailer Designs

Introduction

- The “High Tonnage” study was implemented to evaluate alternative methods of harvesting and transporting woody biomass, study highlights include:
  - Tracked, shear feller buncher (Tier 4 engine)
  - High capacity grapple skidder
  - Clearcut young (10-15 yr. old) stands
  - Transpirational drying
  - Micro chipping (whole tree, clean)
  - Transportation alternatives
- Funded by DOE Grant (DE EE0001036)
- Research partners: Auburn University, TigerCat, Corley Land Services.

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High Capacity Chip Trailer

Study Information

- A 30 acre stand was felled, bunched and allowed to field dry for 6 weeks
- After 6 weeks the trees were skidded and chipped with a disc chipper
- Research Question: If we design and build a larger chip trailer, can we achieve a full legal full payload for hauling a lightweight product?

High Capacity Chip Trailer

- The contractor's traditional trailers were 100 yd^3 (regular) and 88 yd^3 (small)
- The larger capacity trailers were 123 yd^3 (large)
  - 19% more volume than regular trailer
- Load assumptions
  - Load bulk density accounted for chip slope at the rear of the trailer and assumed no other large voids
  - Alabama legal weight limit = 80,000 lbs.... (+10% = 88,000 lbs....)

High Capacity Chip Trailer

- Green moisture content: 54% (wet basis)
- Field dried moisture content: 39% (wet basis)
  - 15% reduction in moisture content
- Chips transported, dry: 1393 tons, 61 loads

	Large-Dry (123 yd^3)	Regular-Dry (100 yd^3)	Small-Dry (100 yd^3)
No. Observations	39	16	6
Avg. Gross Wt., lbs.(tons)	78,648 (39.32)	73,496 (36.75)	68,496 (34.25)
Avg. Net Wt., lbs.(tons)	47,916 (23.96)	43,016 (21.51)	38,473 (19.24)
Avg. Tare Wt., lbs. (tons)	30,767 (15.38)	30,480 (15.24)	30,023 (15.01)
Avg. Density (lbs../ft^3)	14.42	16.00	16.23

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High Capacity Chip Trailer

- Possible reasons for lower density
  - Trailer is too long
  - Chips are too light to be blown and packed at front of trailer
- Possible solutions
  - Higher trailer/ low profile tires (standard length, 40 ft.)
  - Conveyor loading with open top trailer
- The large trailers averaged 10% more weight per load than the regular trailers
- Using the large trailers exclusively would have reduced the number of loads required by 6 (@ 14.42 lbs./ft^3)

High Volume Longwood Trailers

Larger volume, lighter trailers were evaluated for improving payloads of field dried longwood or small diameter wood

- Regular Trailer
  - 40 ft.
  - “Plantation” style
  - Volume inside standards: 2380 ft^3
- Large Trailer
  - 40 ft.
  - “Plantation” style
  - Larger drop behind 5th wheel
  - Super single tires with aluminum rims
  - Volume inside standards: 2790 ft^3

High Volume Longwood Trailers

Methodology

- Study installed on two stands
- Contractor was using the new larger trailers along with his regular trailers to haul green longwood
  - 1st and 2nd thinnings
- Analyzed load tickets for differences between the trailers
  - Truck and tractor combinations were constant
  - Stems were loaded with all butts forward
    - No alternative loading methods were used

High Volume Longwood Trailers

Stand 1

Large Trailer (N=15)	Gross (tons)	Tare (tons)	Net (tons)
Minimum	40.76	13.06	27.45
Maximum	44.79	13.95	31.01
Average	42.67	13.57	29.10
Regular Trailer (N=19)			
Minimum	40.29	14.76	25.35
Maximum	44.91	15.64	29.73
Average	42.85	15.15	27.70
Difference, Avg.	-0.018	-1.58	1.4

High Volume Longwood Trailers

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High Volume Longwood Trailers

Stand 2

Large Trailer (N=52)	Gross (tons)	Tare (tons)	Net (tons)
Minimum	31.35	12.79	18.27
Maximum	42.80	14.76	28.91
Average	38.56	13.52	25.04
Regular Trailer (N=43)			
Minimum	34.71	14.21	18.82
Maximum	43.52	16.30	28.36
Average	39.60	15.27	24.32
Difference, Avg.	-1.04	-1.75	0.72

High Volume Longwood Trailers

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Alternative Loading Techniques

Alternative Loading: Indexing

- Definition: Treelength material loaded alternating butts to tops
- Suitable for plantation 1st & 2nd thinnings (pulpwood)
- Merchandized tree length has to closely match trailer length
- Indexed wood can “jackstraw” upon unloading
- Harder to deck and re-grapple
- Very few mills accept indexed wood

Alternative Loading: Indexing

- Typical Mill Procedure
  - Must be capable of unloading in one grapple bite
  - Indexed wood is not decked
  - Placed directly in debarker
- Gallagher, et. al. 2005. Let's Talk Trucking: Weights and Loading Methods. FRA Technical Paper 05-P-2.
  - Found a 1700lb increase in average load size compared to traditional loading techniques for data at one mill
  - Further comparison of indexed loads to all pulpwood load data showed a 2800 lb advantage (8 mills across Southeast)

Alternative Loading: Untrimmed (Whole) Trees

- Increases in biomass usage for bioenergy and bio-products has required a re-examination of harvesting and transportation systems
- Biomass harvesting may produce a traditional tree stem or a bundle, bale, chip or chunk.
- These alternative products require different handling and transportation systems
- Some biomass markets can take untrimmed (whole) trees as a feed stock

Alternative Loading: Untrimmed (Whole) Trees

Introduction

- Very few forest product companies accept untrimmed trees
- There are potential benefits to accepting untrimmed trees
  - Potentially higher in-woods harvesting productivity
  - Increase in gross tonnage removed
  - Mill receives two products on one load
  - Reduced site preparation costs

Alternative Loading: Untrimmed (Whole) Trees

- Potential disadvantages
  - Specialized trailers to haul untrimmed trees
  - Increased trimming and binding time
  - Increased complexity in setting purchase price
  - Additional handling and processing equipment at mill
- From a harvesting and operations perspective the main potential benefits are:
  - Combining multiple harvesting operations into one
  - Transporting two products on the same load
  - Fewer pieces of equipment needed in the woods (moving costs, labor, etc.)

Alternative Loading: Untrimmed (Whole) Trees

Specialized Trailers: Baskets

- Logging contractors modify trailers with “baskets” between the rear bunks to haul untrimmed trees
- Baskets consist of side panels and a belly pan
  - Designed to contain the limbs and tops within the trailer in order to reduce trimming and make the loads legal for public roads
  - Trailer must have lights visible, two flags and a flashing light
- Baskets are custom built by the logging contractors or local fabrication shops
  - A typical basket could add 1000 – 1500 pounds to the weight of the trailer

Summary

- These studies demonstrate that there are methods harvesting contractors can use to gain payload and transportation efficiencies
  - High volume chip trailers
  - Lighter, high volume longwood trailers
  - Alternative loading techniques
    - Indexing
    - Untrimmed (whole) tree
- The Forest Operations Research Unit is focused on research to identify and quantify new equipment and techniques to bring increased productivity and efficiency to the forest industry

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