In-Field Transport of Woody Crops

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Outline

Introduction
Φ Study Overview
Φ Stand Information
Φ Trucks

In-Field Transport Operation

Road Design

Truck Unloading Time

Bulk Density

Summary
Introduction
Introduction

GreenWood Resources
Boardman, OR
Introduction
Introduction

**STAND INFORMATION**

Hybrid poplar
Various genetics
Variety of volumes/planting trial
40 acres, 3 years old
Dual and single row planting
10 ft between rows
1100 & 2200 tpa
Harvesting by SUNY-ESF
Introduction

TRUCK 1

TRUCK 2
Introduction

TRUCK 3

TRUCK 4
Introduction

TRUCK 5
In-Field Transport Operations
In-Field Transport Operations

SPROUT TRUCK ORIENTATION

Following in a new row Uncut rows on either side
In-Field Transport Operations
In-Field Transport Operations

ROADWAY

Designed road width: 40 ft
Road width tree-to-tree: 38 ft
In-field Transport

END ROW STEMS

Tire damage due to off-tracking
Road Design
Road Design

DESIGN VEHICLE: SINGLE-UNIT (SU) TRUCK

- Trucks 1, 2, 3 & 4

Road Design

Single-Unit (SU) Truck

Radius of Path of Front Overhang = 43.5 ft.

Radius of Inside Rear Wheel = 28.3 ft.

Off-Tracking = 15.2 ft.

Road Design

DESIGN VEHICLE: INTERMEDIATE SEMITRAILER (WB-12[WB-40])

- Truck 5

Road Design

Intermediate Semitrailer (WB-12 [WB-40])

Radius of Path of Front Overhang = 40.8 ft.

Radius of Inside Rear Wheel = 19.3 ft.

Off-Tracking = 21.5 ft.


Southern Research Station
Forest Operations
Road Design

Design Vehicle
Minimum Radius

<table>
<thead>
<tr>
<th>Radius (ft.)</th>
<th>Min. Front Overhang</th>
<th>Min. Inside Rear Wheel</th>
<th>Off-Tracking</th>
</tr>
</thead>
<tbody>
<tr>
<td>SU</td>
<td>WB-12/WB-40</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Southern Research Station
Forest Operations
Truck Unloading Time
Truck Unloading Time
Truck Unloading Time

Mean Elemental Times

- Travel
- Position
- Dump
- Open gate
- Close gate

- T1 - 40 yd3
- T2 - 40 yd3
- T3 - 23 yd3
- T5 - 60 yd3
Truck Unloading Time

Unloading Production Rates

- 23 yd³: 1.98 Green tons/min
- 40 yd³: 2.43 Green tons/min
- 60 yd³: 3.42 Green tons/min
Transportation and Bulk Density
### Transportation and Bulk Density

<table>
<thead>
<tr>
<th>Sample ID</th>
<th># Reps</th>
<th>Wet Bulk Density (lb/ft^3)</th>
<th>Moisture Content (% wb)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Plot 11</td>
<td>7</td>
<td>18.91</td>
<td>0.301</td>
</tr>
<tr>
<td>Plot 14</td>
<td>6</td>
<td>18.94</td>
<td>0.387</td>
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</table>
Transportation and Bulk Density

Theoretical max load based on lab density of 19 lbs/ft³

<table>
<thead>
<tr>
<th></th>
<th>Truck 1</th>
<th>Truck 2</th>
<th>Truck 3</th>
<th>Truck 4</th>
<th>Truck 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bed Vol. (ft³)</td>
<td>1083</td>
<td>1083</td>
<td>612</td>
<td>647</td>
<td>1616</td>
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<tr>
<td>Avg. Gross Weight (lbs.)</td>
<td>45136</td>
<td>44419</td>
<td>34657</td>
<td>45077</td>
<td>67160</td>
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<tr>
<td>Avg. Tare Weight (lbs.)</td>
<td>25820</td>
<td>25140</td>
<td>23227</td>
<td>32880</td>
<td>34180</td>
</tr>
<tr>
<td>Avg. Net Weight (lbs.)</td>
<td>19464</td>
<td>19235</td>
<td>11393</td>
<td>11943</td>
<td>32980</td>
</tr>
<tr>
<td>Theoretical Max (lbs.)</td>
<td>20577</td>
<td>20577</td>
<td>11628</td>
<td>12293</td>
<td>30704</td>
</tr>
<tr>
<td>Load Density (lbs./ft³)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Min.</td>
<td>13.53</td>
<td>13.68</td>
<td>14.7</td>
<td>15.17</td>
<td>18.97</td>
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<tr>
<td>Max.</td>
<td>23.41</td>
<td>22.11</td>
<td>24.63</td>
<td>21.2</td>
<td>21.41</td>
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<tr>
<td>Avg.</td>
<td>17.97</td>
<td>18.94</td>
<td>18.61</td>
<td>18.45</td>
<td>20.4</td>
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<tr>
<td>Obs. (#)</td>
<td>19</td>
<td>14</td>
<td>14</td>
<td>6</td>
<td>4</td>
</tr>
</tbody>
</table>
Transportation and Bulk Density

Density > 19 lbs/ft³ represents chips above trailer sides
Density < 19 lbs/ft³ represents less than full load
Transportation and Bulk Density

95-100% of capacity

98% of capacity

108% of capacity
Trucks

Load exceeds bin volume
Trucks

INCOMPLETE CAPTURE
Summary
Summary

- Narrow roadways can increase the truck turnaround time due to additional maneuvering requirements.
- Access roadway width should be designed for specific vehicle types.
- Narrow access routes can result in tire damage.
- Bulk density of processed product can impact transportation efficiencies.
Thank you

ACKNOWLEDGEMENTS

GreenWood Resources
SUNY-ESF

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