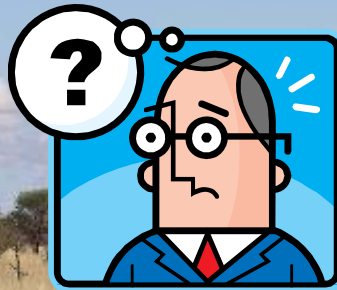
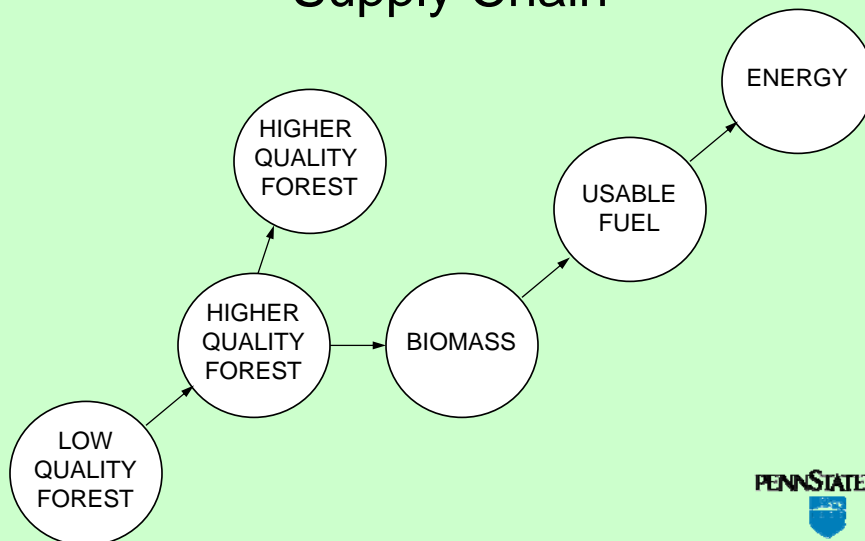


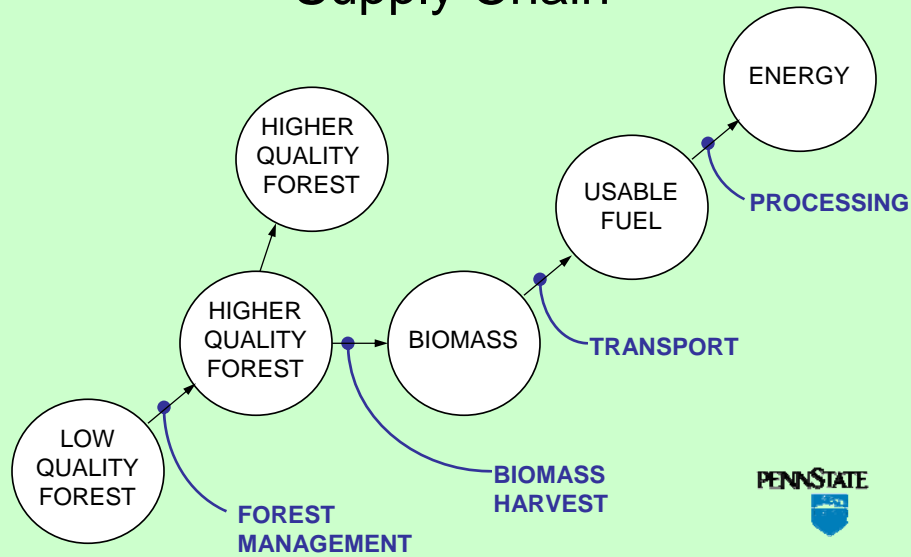
What is “pre processing”?



Pre-processing as Part of the Supply Chain

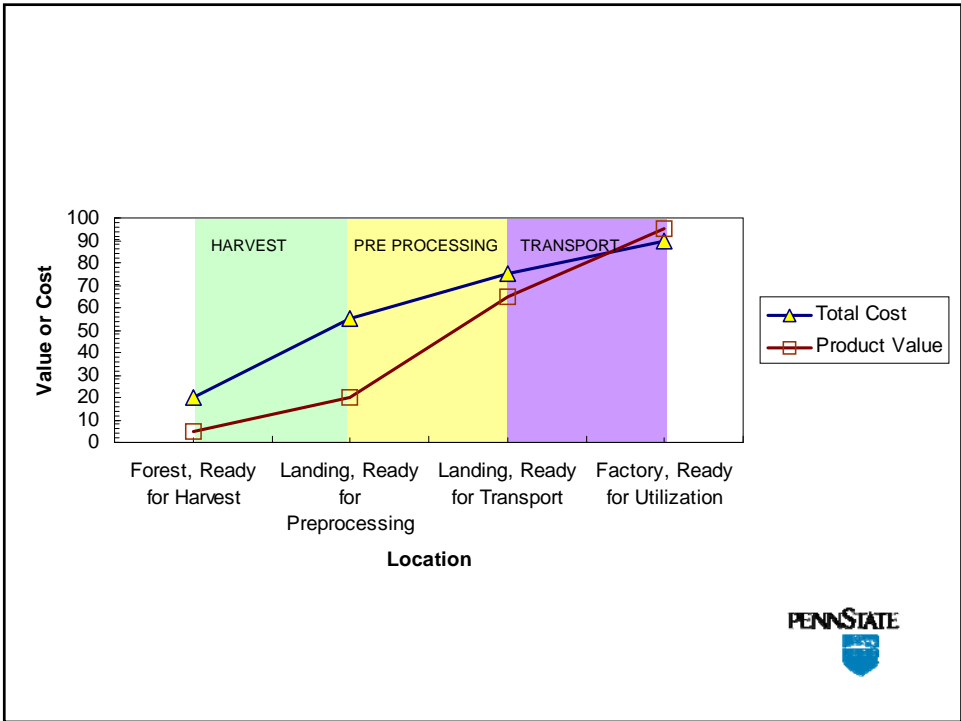
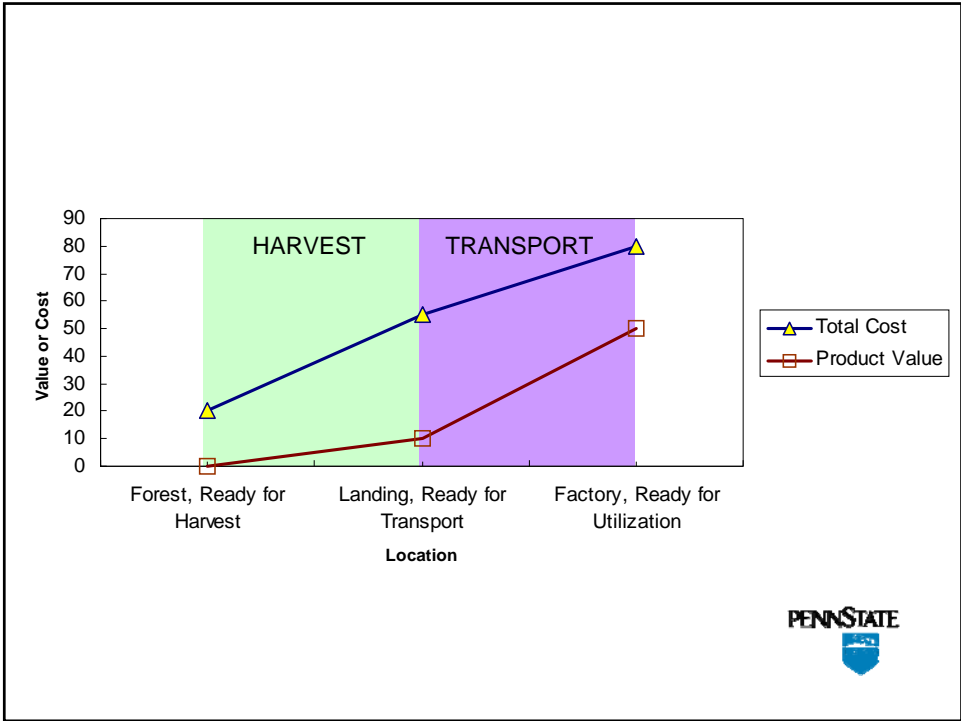


Pre-processing as Part of the Supply Chain



The key question:

- Can pre-processing make the overall system work better / be more cost effective?



Potential Benefits of Pre-Processing

- Easier to handle
- Easier to store
- Easier to transport
- Easier to transform into energy

Increased value
to biomass,
Improved effectiveness
of supply chain



Pre-processing Options

- Size Reduction
 - Chipping and Grinding
- Densification
 - Bundling, Baling, Pelletizing, Briquetting
- Drying
- Thermochemical Conversion
 - Torrefaction, fast pyrolysis, slow pyrolysis, gasification, hydrothermal treatment
- Biochemical Conversion
 - Digestion
- Fiber Expansion

Size Reduction



Size Reduction

IN-FOREST CHIPPING
AT-PLANT CHIPPING

\$22 per green tonne
\$8 per green tonne

WOOD GRINDING
BALE GRINDING

\$17-22 per green tonne
\$6-10 per green tonne



Bundling and Baling



<http://www.fs.fed.us/woody/biomass/strategy/bundling/pnf-bonners.shtml>

<http://www.granderson.com/en/biomass/biobalen-system>



Bundling and Baling

BUNDLING FOREST WOOD RESIDUES collect, bundle, forward	\$13-17 per green tonne
BALING FIELD CROPS – small bales mow, rake, bale	\$10-42 per green tonne
BALING FIELD CROPS – large bales mow, rake, bale	\$13-26 per green tonne
BALING WOOD RESIDUES bale, forward	\$23 per green tonne
BALING SRWC bale, forward	\$16 per green tonne



Drying

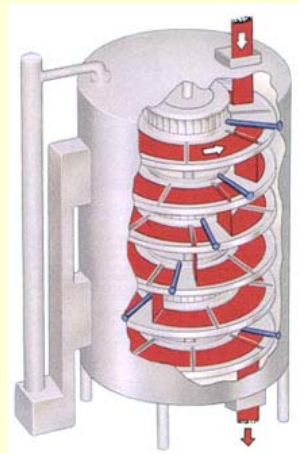


ROTARY DRUM DRYING OF WOOD CHIPS

\$1.5 – 3 per green tonne
3-9 MJ per kg H₂O



Torrefaction



http://www.wyssmont.com/product_detail.php?section=Dryers&id=1

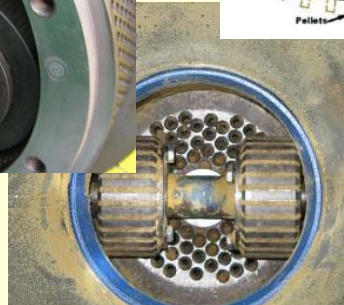
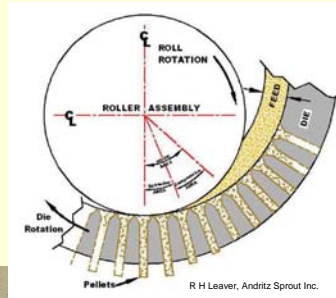
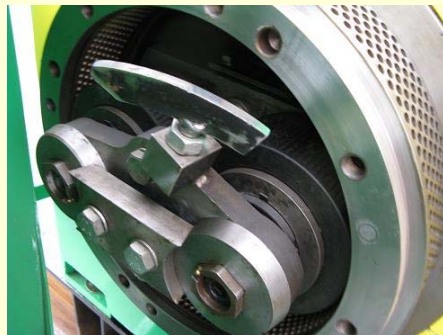


Torrefaction

GRINDING	\$17 – 22 per green tonne
DRYING	\$1.5 – 3 per green tonne
ROASTING	\$19 per green tonne
TOTAL	\$37.5 – 44 per green tonne



Pelletizing

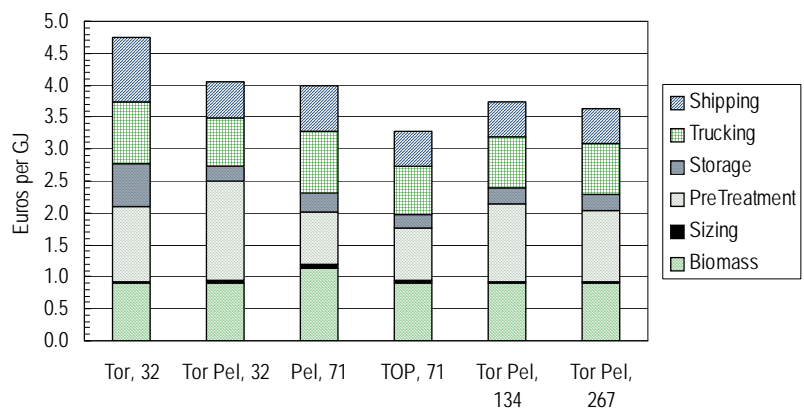


Pelletizing

GRINDING	\$17 – 22 per green tonne
DRYING	\$1.5 – 3 per green tonne
PELLETIZING	\$20 per green tonne
TOTAL	\$38.5 – 45 per green tonne



Does Pre-Processing Reduce Overall Costs?



Should we Pre-Process?

- Pre-processing biomass is costly and rather uncertain
- However, pre-processing could improve the overall efficiency and effectiveness of the supply chain
- The efficacy of biomass pre-processing in the northeast region needs careful assessment



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