



Potential of using MPB infested wood for fuel pellet production: Cost Benefit Analysis

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IEA Bioenergy Workshop

Vancouver

August 28, 2006

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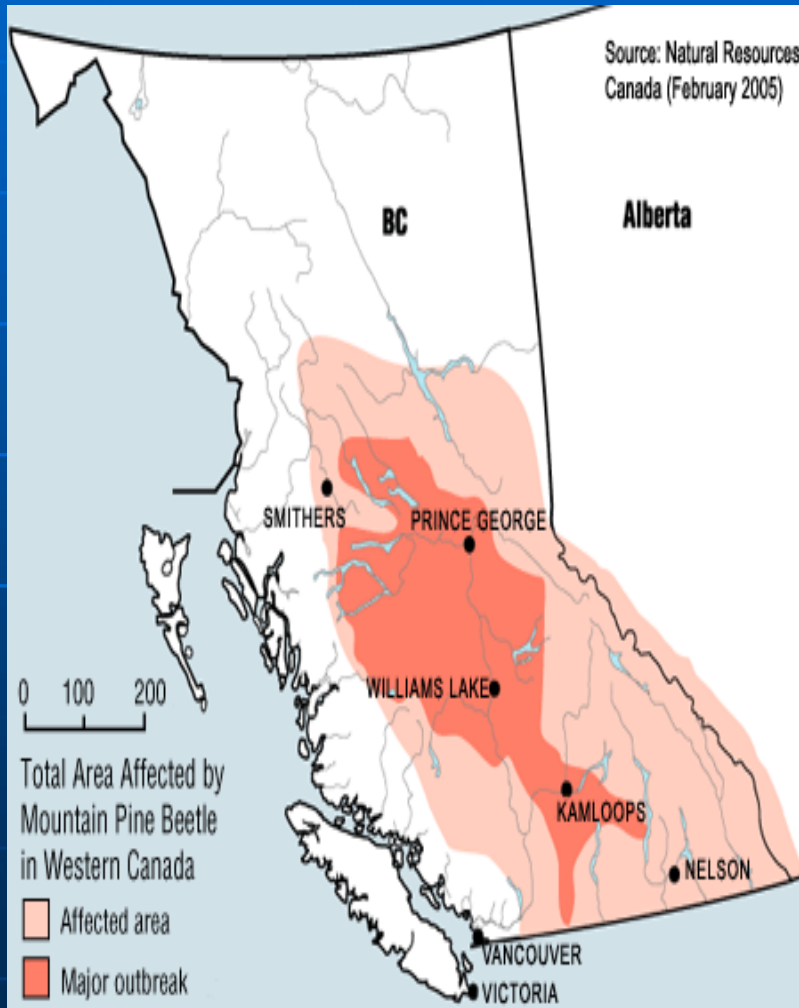


Presentation Outline

- Introduction
- Fuel pellet production
- Cost analysis
- Results and Discussions
- Conclusions



Introduction



MPB infested wood – 420 million m³ – Year 2005

Potential feedstock for bioenergy

- power, heat, ethanol, bio-oil and wood pellets

Source: BCMFR (2006)



Pelletization Process

- Biomass pelletization is a process of reducing the bulk volume of the material by mechanical means for easy handling, transportation and storage.
 - Product - **pellets**



Pelleting Process



60 – 150 kg/m³ (4-10 lb/ft³)

~650 kg/m³ (40 lb/ft³)



Advantages of Pelletization

Uniform in size, density and moisture content

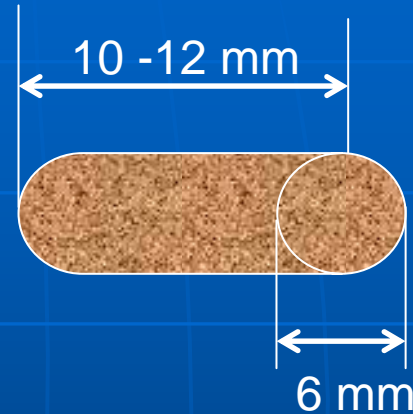
Moisture content: 6 to 8% (wb)

Easy to transport, convey and feed using the existing systems

High heating value: 18.5 GJ/t

Export commodity - >70% pellets produced are exported to Sweden, Denmark, Netherlands, USA

Domestic heating, animal bedding, power generation



Canada =~1 million t pellets
Export demand = 3-5 million t



Fuel Pellet Production

**Biomass feedstock,
40% mc**

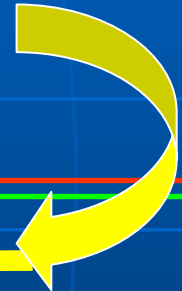


**Transport to
pelleting plant**



**On-site residue
storage**

Feedstock Supply



**Residue
screening**



Drying



Grinding



Pelleting



Cooling



Screening



**Pellet
storage**



Transport

Pelletization Process

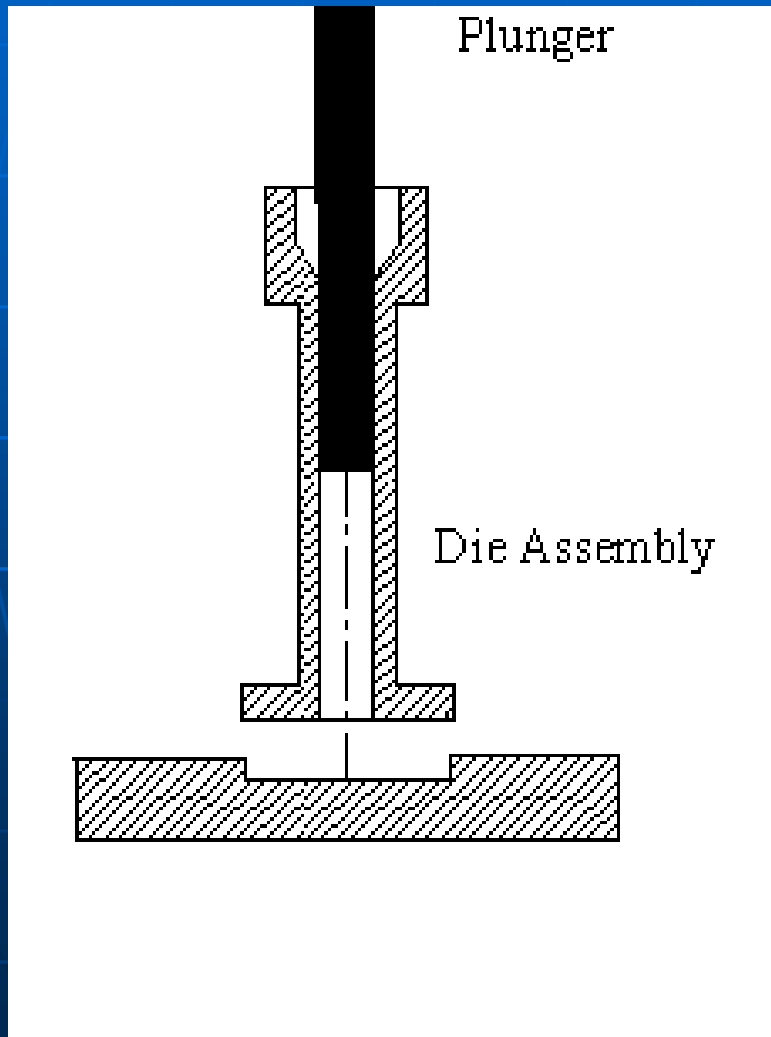


Objectives

- To investigate the pelleting characteristics of MPB infested wood
- To conduct a cost benefit analysis of producing MPB wood pellets



Pelleting Characteristics



**Material: Non infested pine
& MPB wood**

Force: 2.5 & 4 kN

Temp.: 90, 100, 110 C

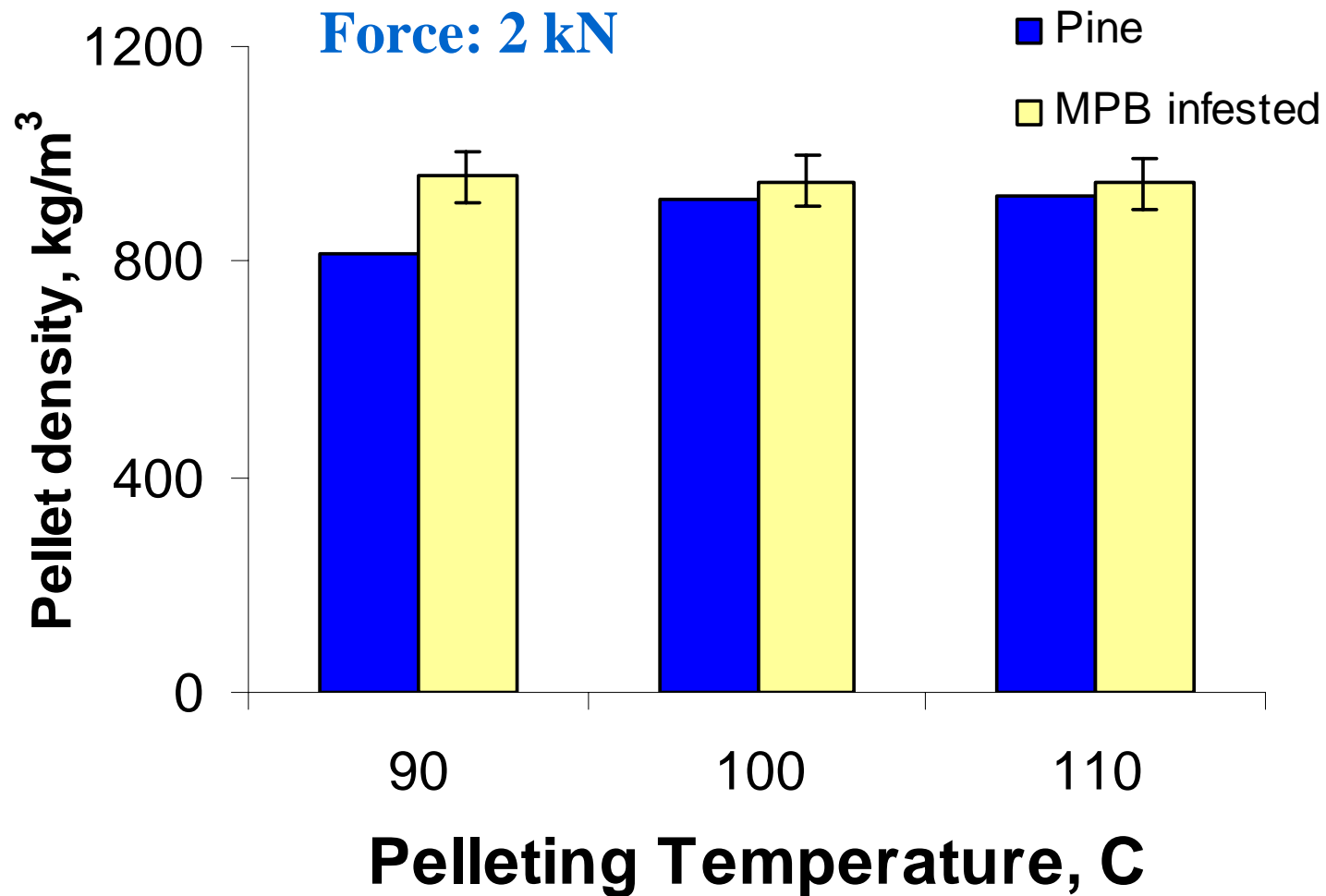
Moisture : 10 % wb

-Pellet density

-Heating value



Pellet Density vs Temp.



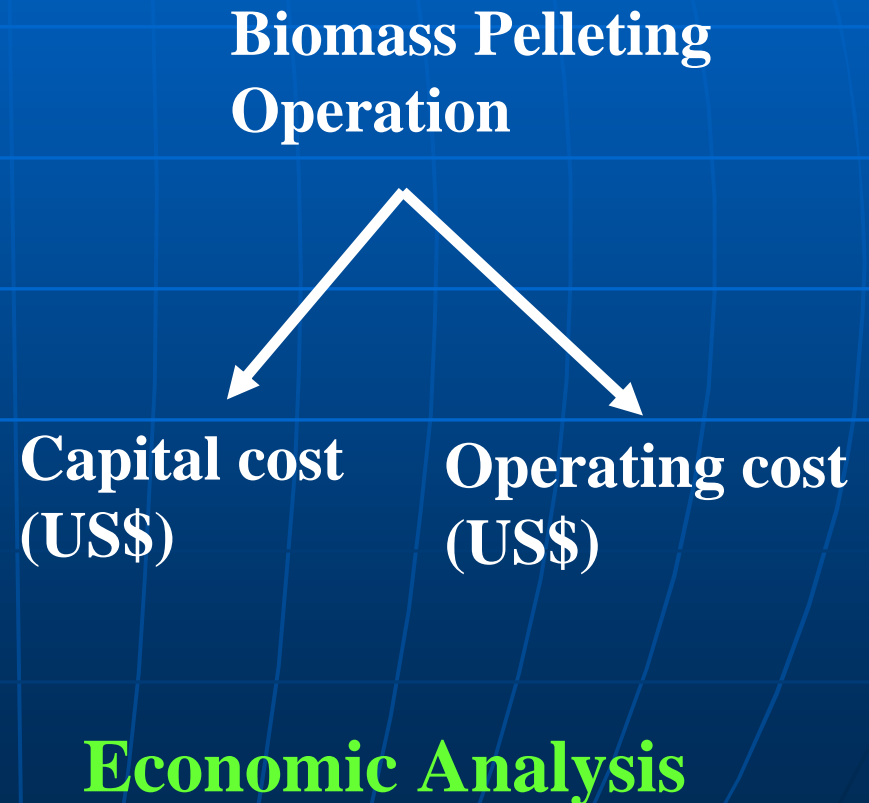
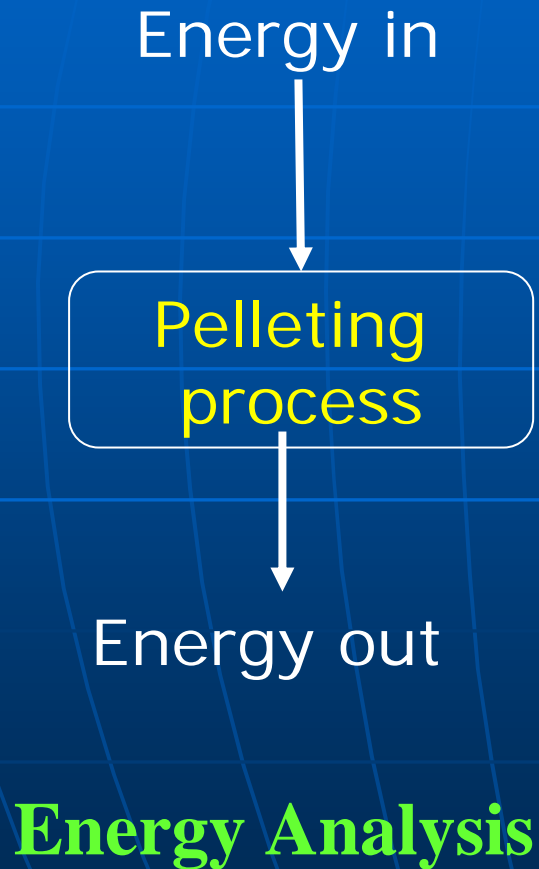


MPB wood pellets

- Moisture content = 10.54 % (wb)
- Pellet density = 995 – 1042 kg/m³
- Heating value = 19.3 MJ/kg
- Lignin = 19.5%
- Cellulose = 53.8%
- Hemi-cellulose = 19.1%
- Extractives = 7.5%



Cost Analysis



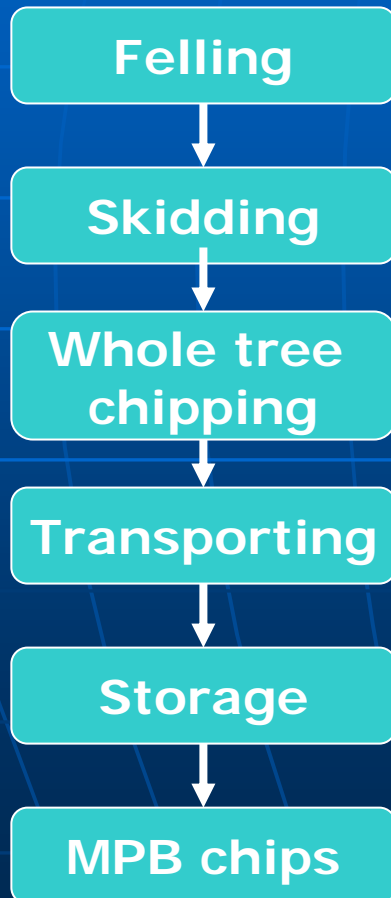


Assumptions

- Feedstock – MPB wood at 15% mc
- Feedstock transport distance – 10 km
- Pellet plant size – 6 t/h
- Operating hours – 7500 h/y, three shifts, 24 h a day



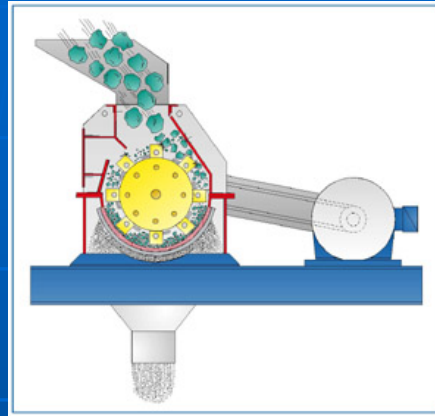
MPB wood supply logistics



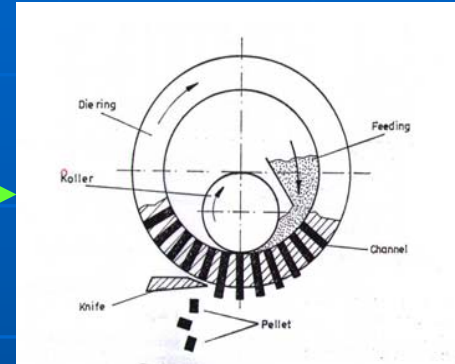


MPB Chips into Pellets

**MPB wood
Chips**



Grinding



Pelleting

Pellets



**Cooling &
Screening**



**MPB pellets
for export**

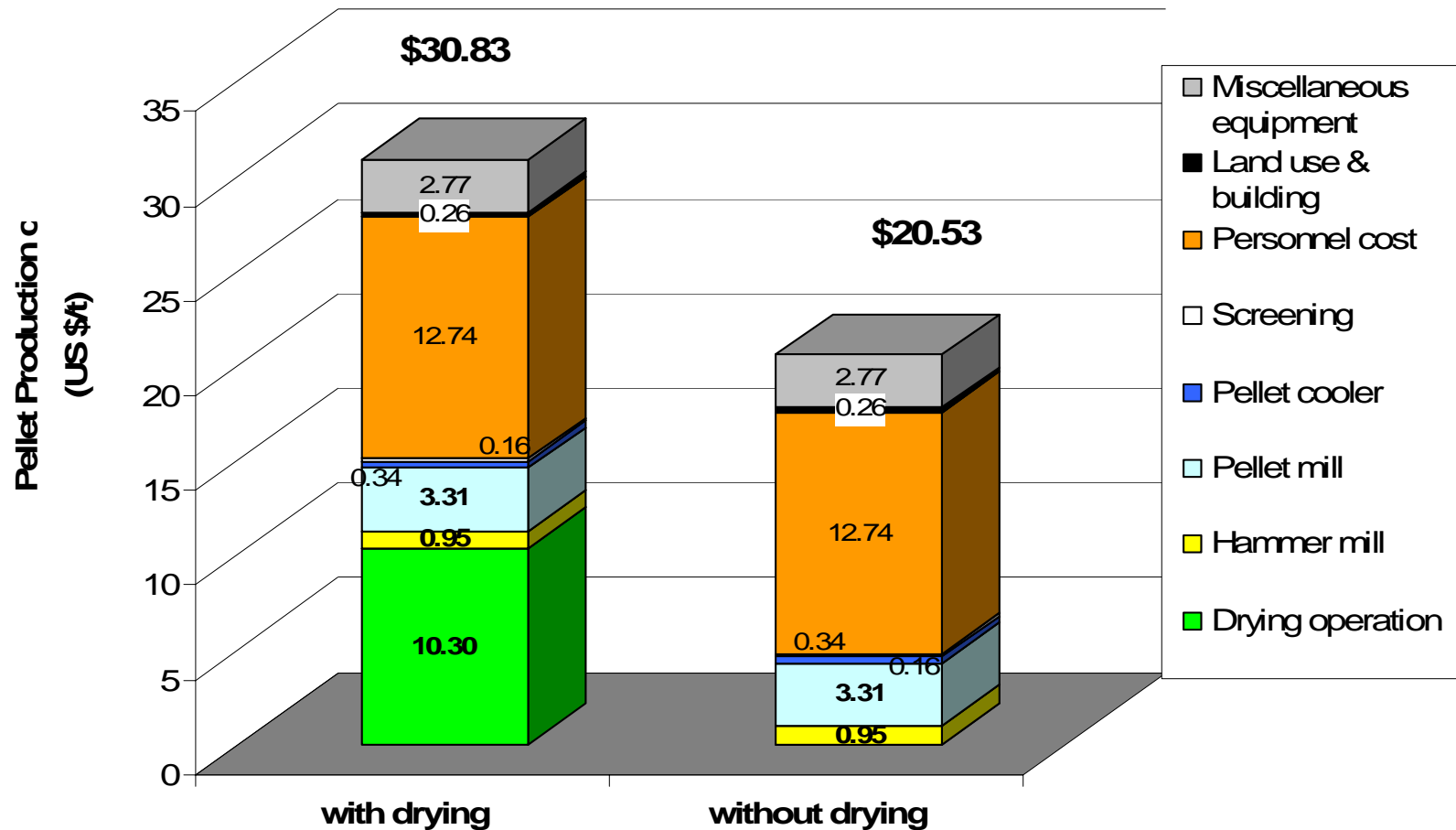


Energy Consumption of Pelleting Process

Operations	MJ/t of pellets	% change
Drying	2826	72
Size reduction	311	7.9
Pelleting	456	11.6
Cooling	75	1.9
Screening	81	2.1
Miscellaneous	176	4.5
Total	~1000	100

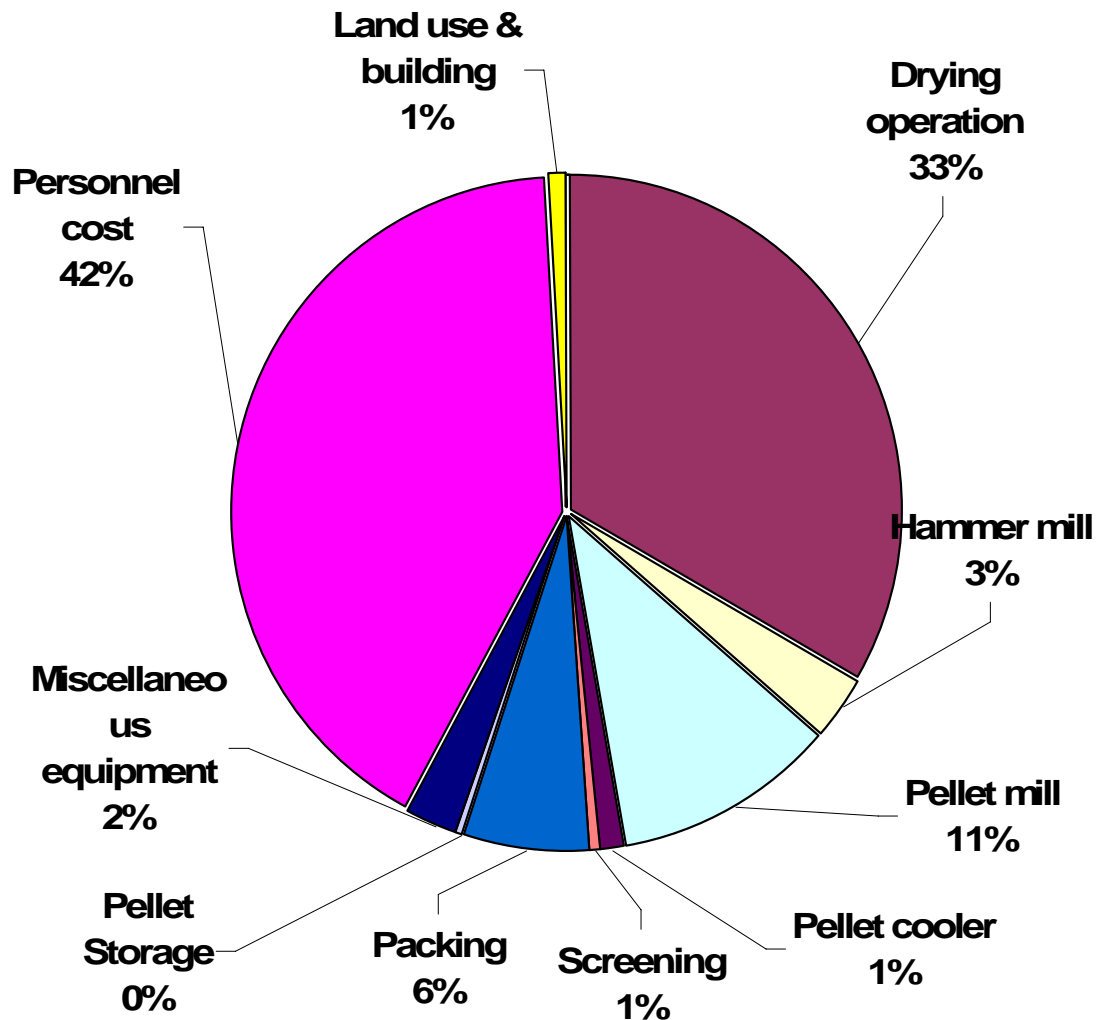


Pellet Production Cost



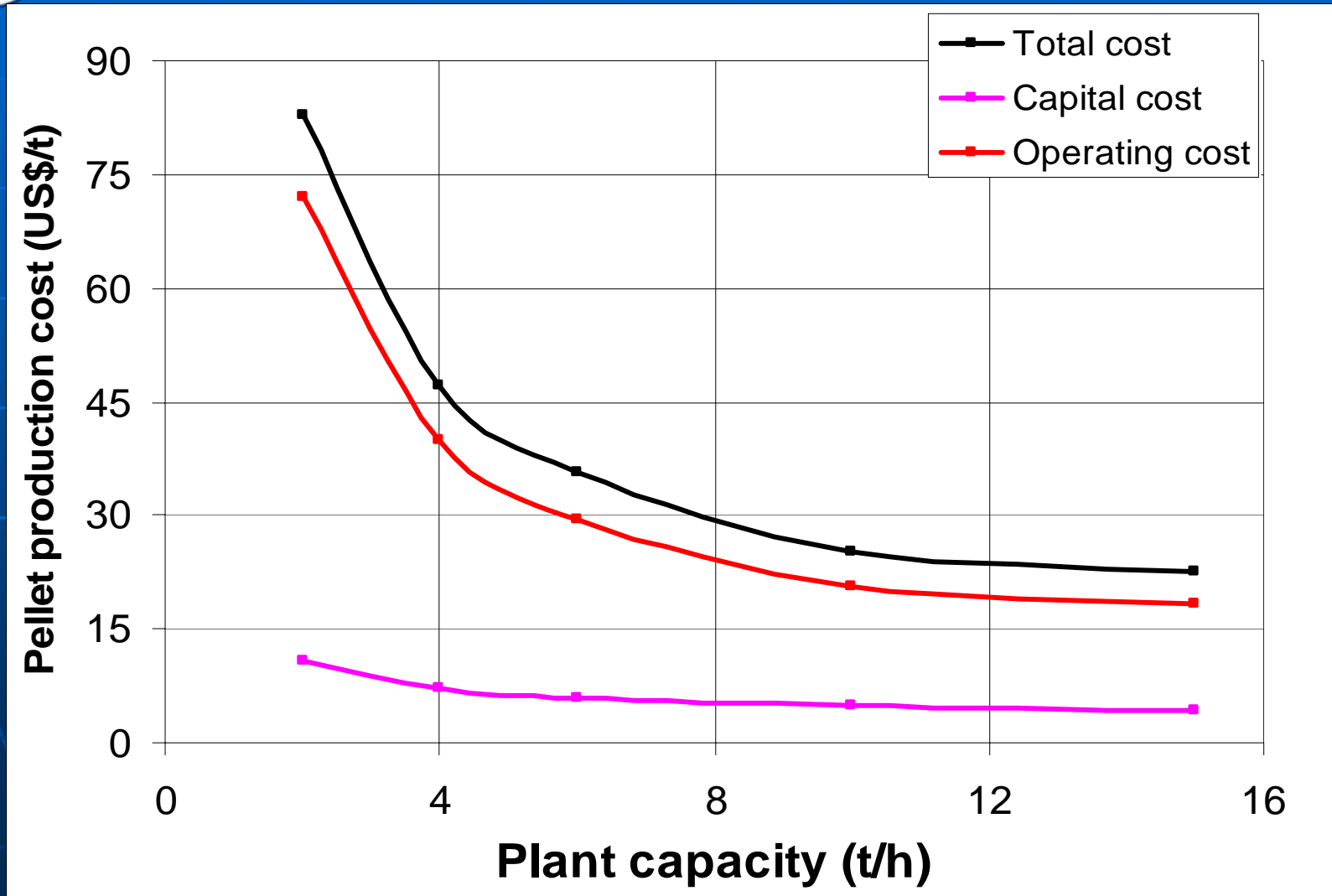


Pelleting Cost Distribution





Pelleting Cost vs Plant Size





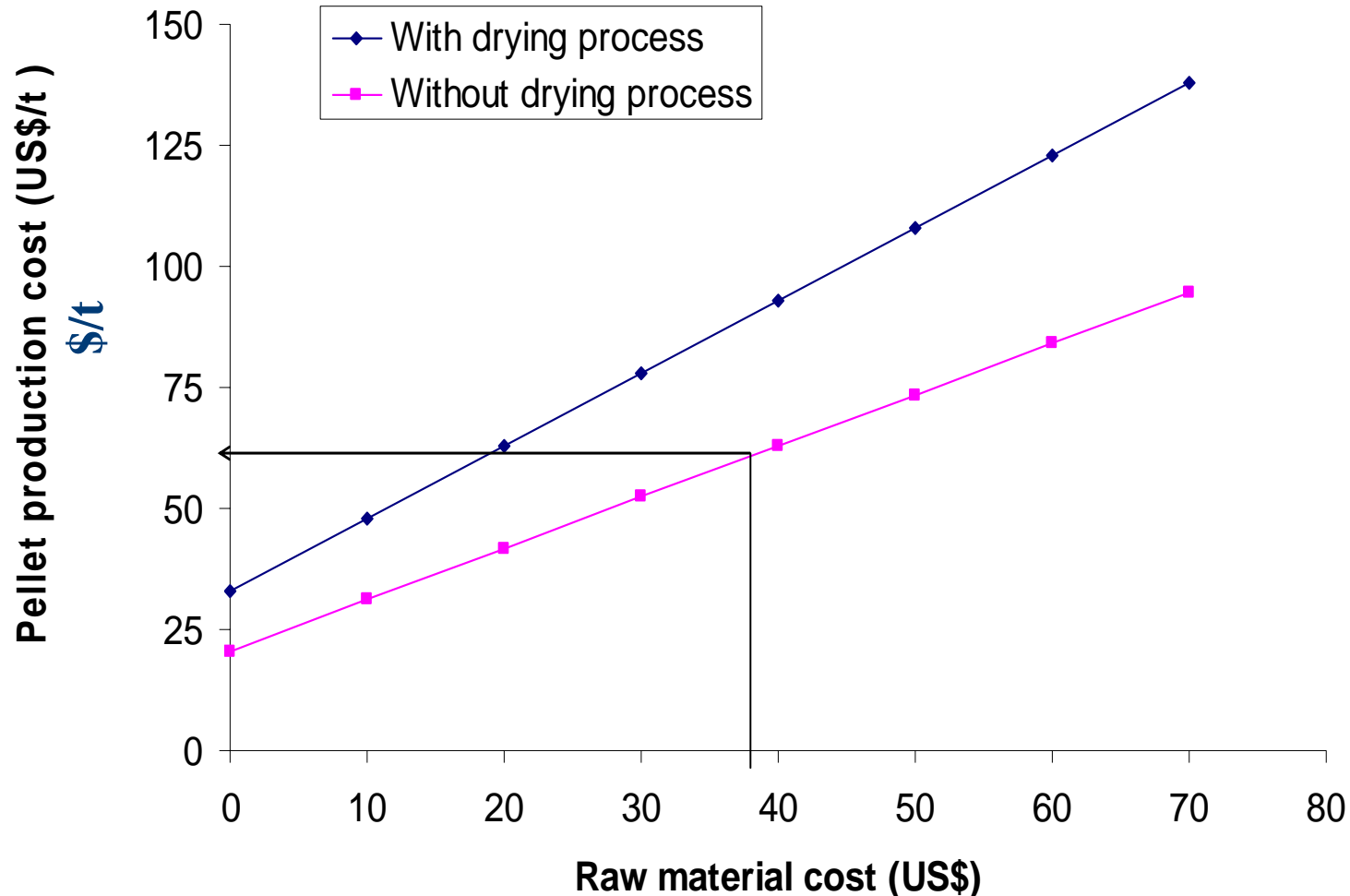
MPB Feedstock Cost

Operations	Production cost*, US\$/t of pellet	
Felling	4.88	\$37.2
Skidding	4.46	
Whole tree chipping	3.94	
Chip transport (50 km round trip)	16.80	
Storage (piling)	7.16	
Pelleting without drying	20.53	
Total	57.77	

*based on a pellet plant capacity of 6 t/h



Pellet Production Cost vs Feedstock Cost





Conclusions

- MPB infested wood can be potentially used to produce fuel pellets for the export market.
- If drying is eliminated, pelleting process requires only 1GJ/t of pellet.
- MPB infested wood into pellets costs about \$58/t of pellets and the cost can be further reduced with large scale pellet plants.



Acknowledgement

Dr. Shahab Sokhansanj

Dr. Xiaotao Bi

Dr. Taraneh Sowlati

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Thank you



Fuel Pellet Production