



Effects of rough delimiting of coniferous crowns on biomass and nutrient exports and the productivity of the forest wood chip production chain

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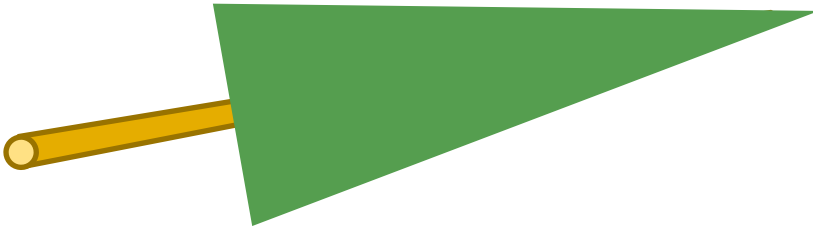
Introduction

- Rising demand for wood chips from forests
- Most important raw material are coniferous crowns/forest residues
- Increased biomass and nutrient export may lead to soil depletion on sites with low levels of available nutrients
- Bavaria: decision on degree of biomass utilisation in consideration of local site conditions

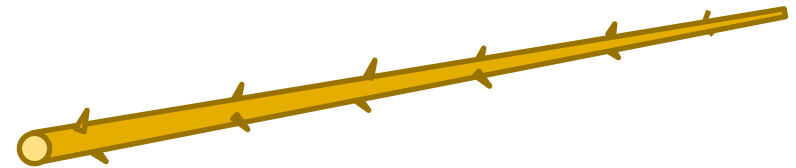


Rough delimiting of crowns

Whole crowns



Roughly delimited spindles



Methods: Field trials

- Field trials
 - Motor-manual harvest, extraction by forwarder
 - Fully mechanised harvest, extraction by forwarder
- Time studies
 - Harvesting
 - Forwarding
- Sampling of wood chips



Methods: Biomass sampling

- 5-7 representative trees in each stand
- Weighing and sampling of different tree sections
- Further analysis in the laboratory (MC, nutrient concentrations)



Field trials

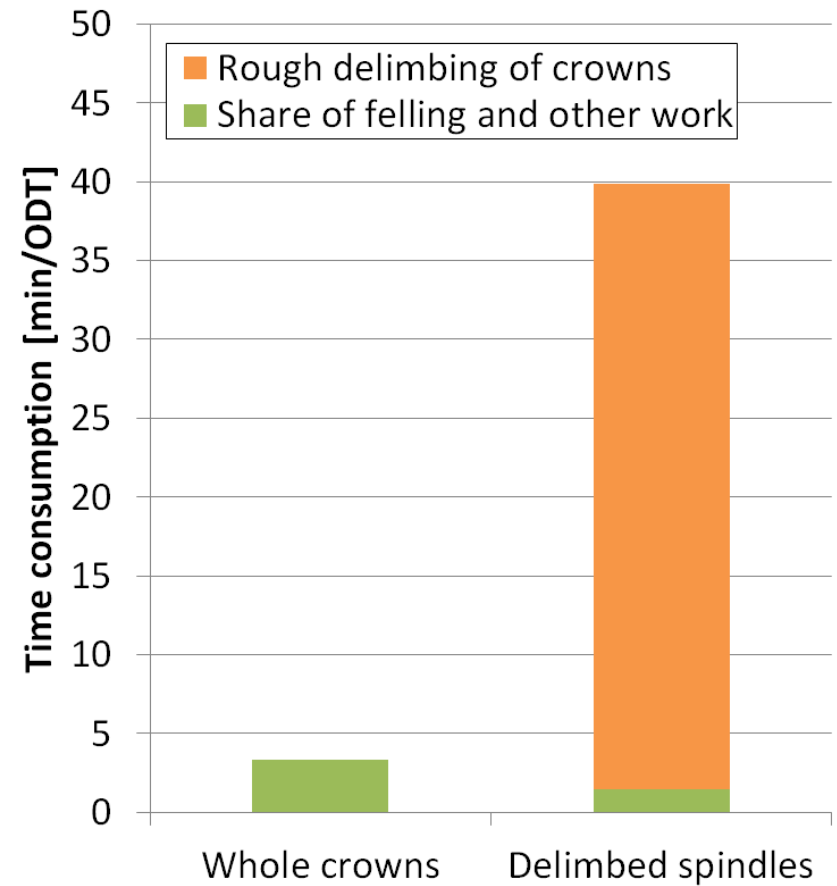
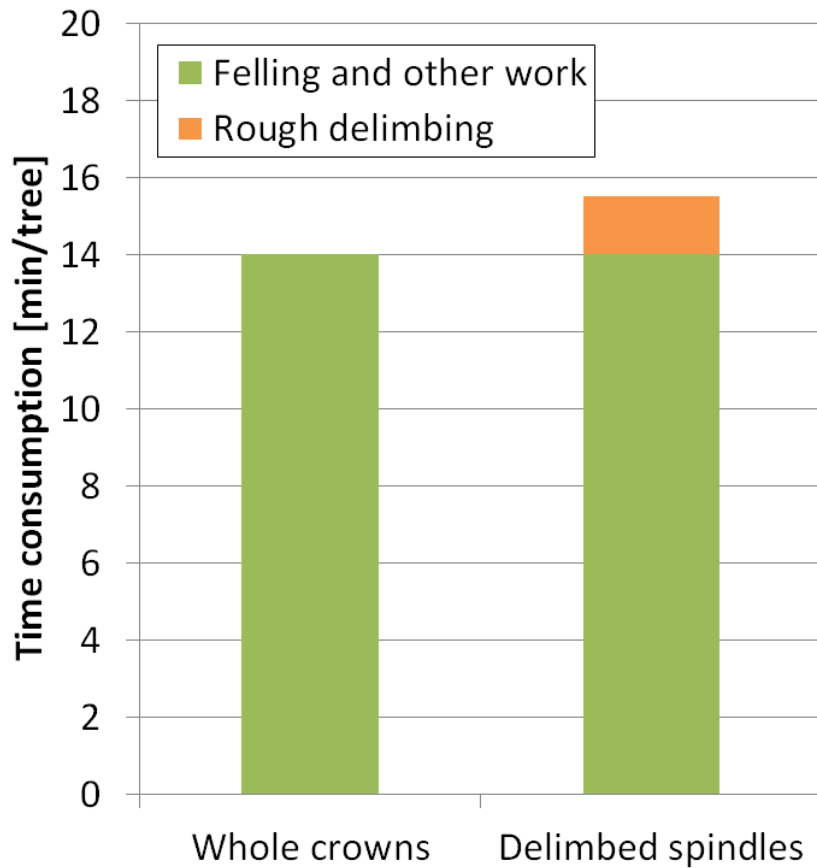
■ Motor-manual harvest



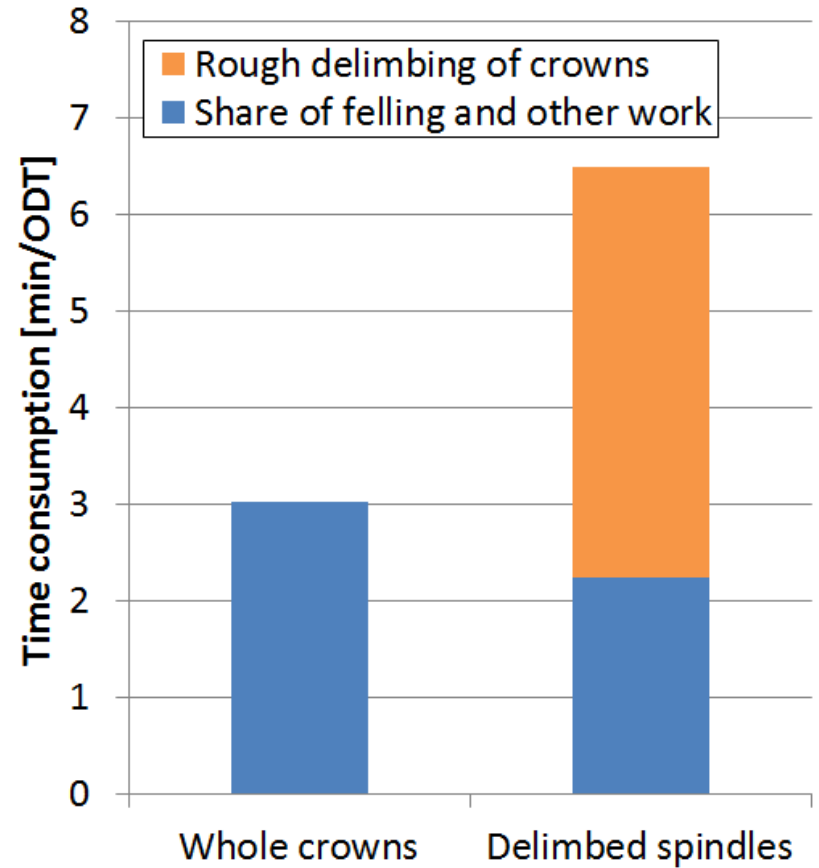
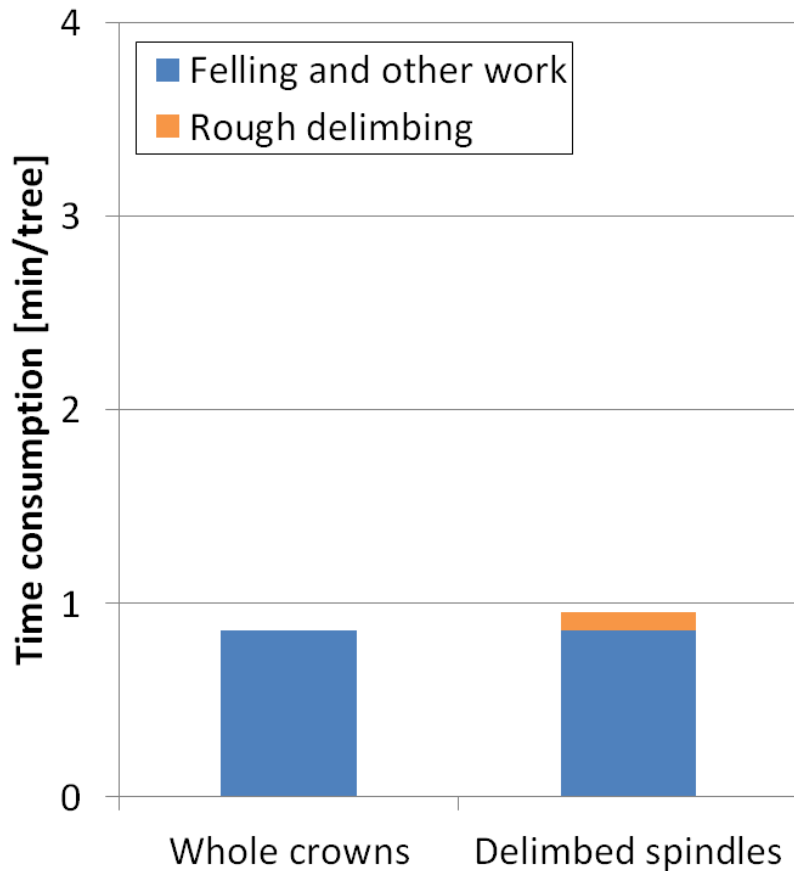
■ Fully mechanised harvest



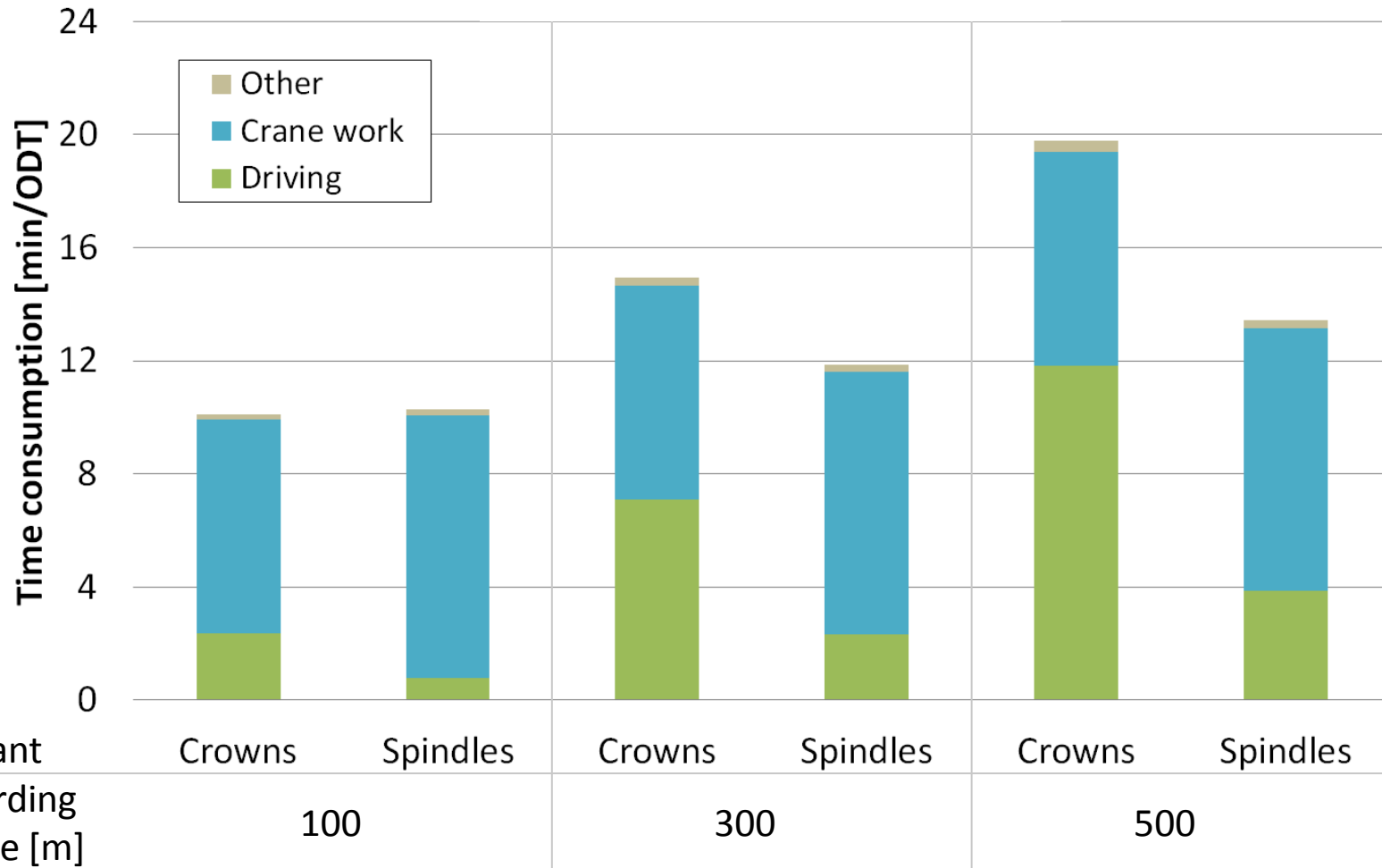
Results: Motor-manual harvesting



Results: Fully mechanised harvesting



Results: Forwarding



Results: Wood chip production cost

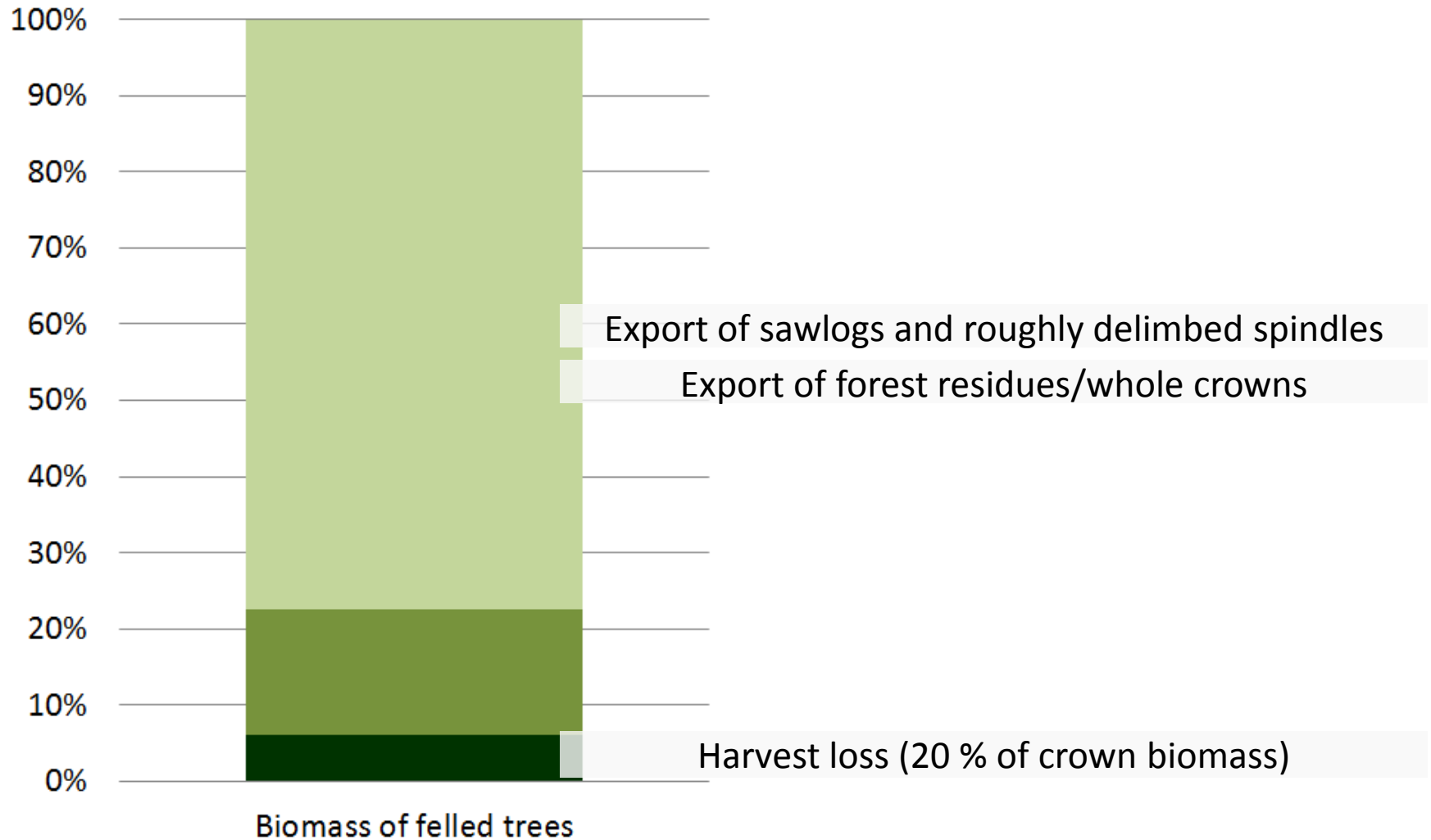
Fully mechanised variant		
	Whole crowns	Roughly delimiting spindles
Share of felling and other costs	11.20 €/ODT	7.24 €/ODT
Rough delimiting of crowns	-	10.95 €/ODT
Forwarding	22.41 €/ODT	17.77 €/ODT
Chipping	18.16 €/ODT	14.53 €/ODT*
TOTAL	51.77 €/ODT	50.49 €/ODT
Harvester: 155 €/PMH ₁₅ ; Forwarder: 90 €/PMH ₁₅ ; Chipper 245 €/PMH ₁₅		

Results: Wood chip quality

Case study	Variant	Fine fraction (< 3.15 mm) [w-%]	Ash content [w-%]
Motor-manual	Whole crowns	25.6	2.2
	Delimbed spindles	11.6	0.9
Fully mechanised	Whole crowns	28.4	1.4
	Delimbed spindles	5.0	0.5



Results: Biomass exports - Site 1 (Selb forestry district)



Conclusions

- Compared to conventional utilisation of forest residues/crowns, the method of rough delimiting leads to:
 - Additional expenditure of time in harvesting
 - Higher productivity in forwarding
 - Higher wood chip quality
 - Considerable reduction of biomass and nutrient exports
- The method can be a suitable alternative on sites with relatively low levels of available nutrients

Thank you for your attention!

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