

Harvesting firewood from coppice with a hardwood harvester

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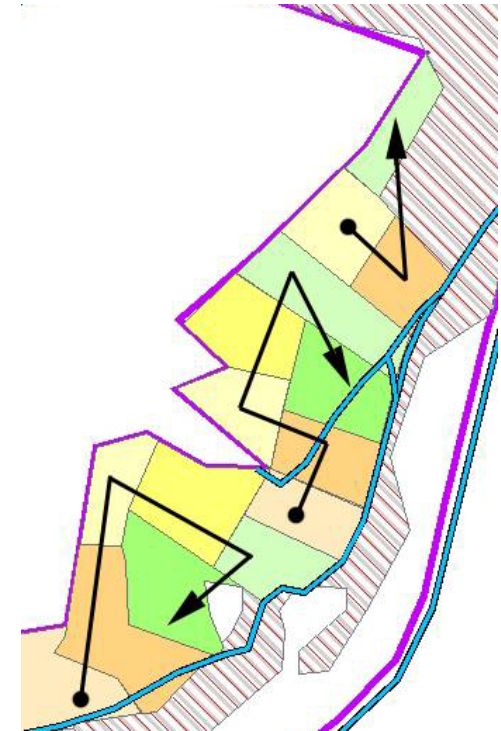
**UNI
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- Definition coppice
- Study area and special conditions
- Harvesting in flat terrain
 - Results of some case studies
 - Economic results
- Conclusions

Definition of coppice



- Clear cuts
- Growing from resprouting
- Rotation cycle 1-40 years



- In Germany overaged coppice (60-100 years)

Study area Rhineland-Palatinate



Source: OpenGeoDB

- Circa 80.000 ha governmental owned overaged coppice
- Circa 80.000 ha private owned overaged coppice
- Today in different vegetative stages:
 - High forest
 - Conversion to high forest
 - Coppice (mostly overaged)
 - Coppice with standards
 - Extremely dry and poor site conditions
- Important for nature conservation
- Big potential for rural areas

Harvesting options



Flat terrain
Motormanual
traktor
Harvester
Forwarder
Clambunkskidder

Steep terrain harvester
Steep terrain forwarder

Steep terrain
Motormanual
traktor

Cable crane

wood for saw mills



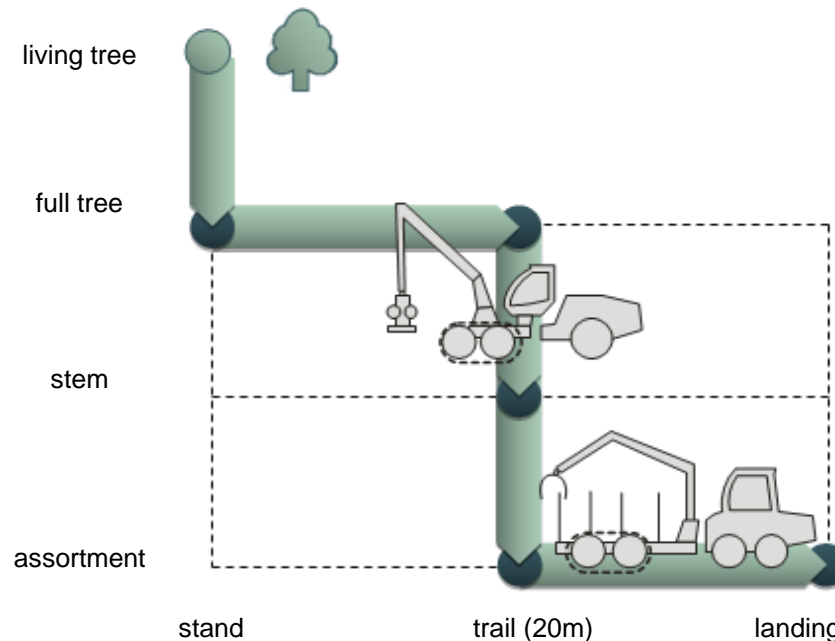
firewood



wood chips



- Clear cuts to create traditional coppice structures
- Harvester felled trees and processed to 4m firewood
- No utilization of crowns
- Skidding with forwarder to landing
- Stand:
 - Dbh avr. 17cm
 - Oak/hornbeam
 - 60% trees from resprouting



Harvesting in flat terrain



Machines



Harvester: HSM 405H 6 WD, 172 kW, 16 t
Head: CTL 40 HW:
max. cut diameter 430 mm,
740 kg weight,
Feed rate 4,5 m/s

Forwarder: HSM 208F:
130 kW, 9 t,
Boom: Loglift F83 FT 100 (10m)

Difficulties for fully mechanised harvesting



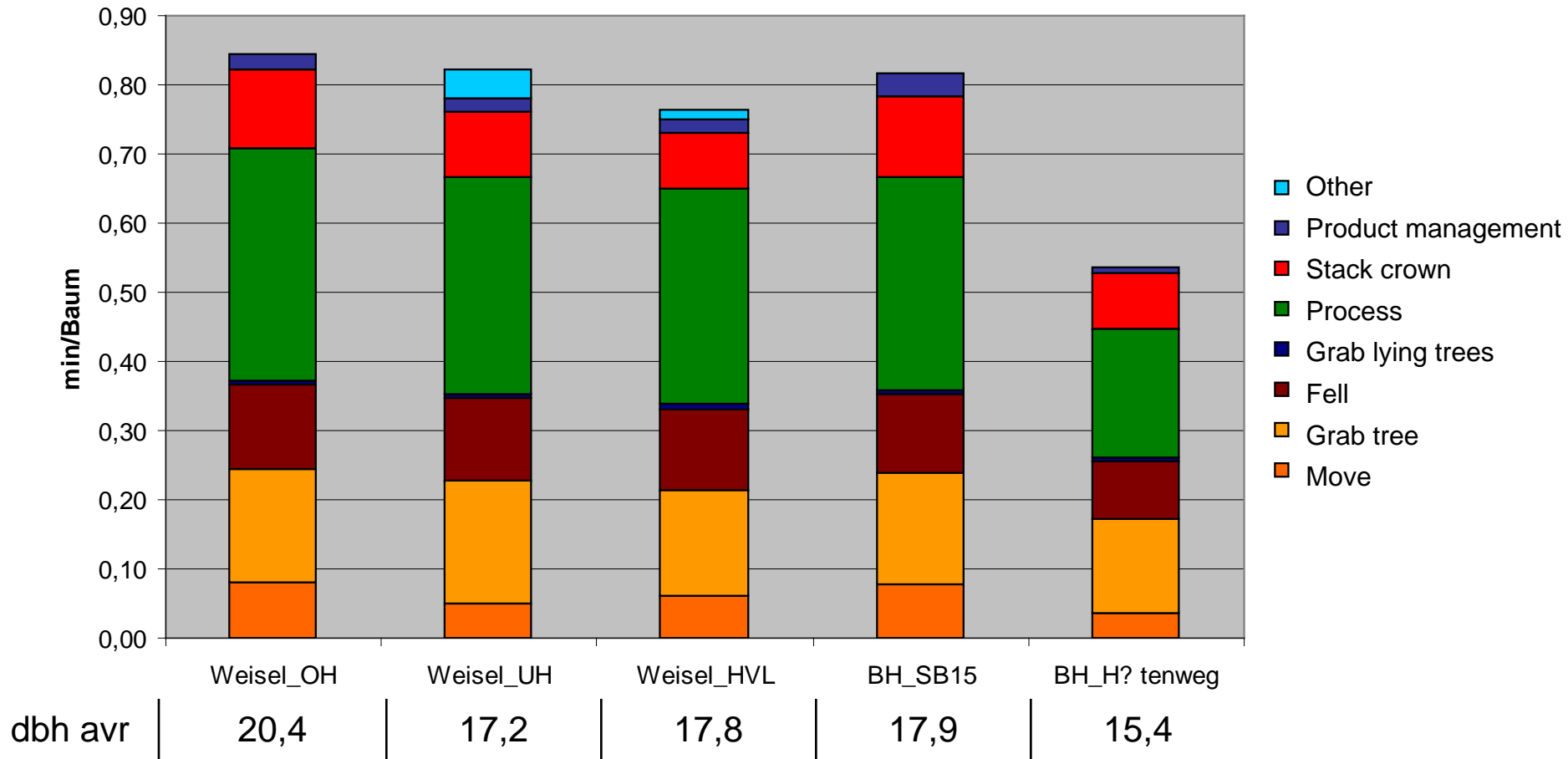
- Difficulties of full mechanised harvesting hardwood
 - Bad form
 - Branches
- Special difficulties harvesting coppice
 - Multiple stems
 - Small tree volume
 - Irregular shape of the butt end



Results Harvester



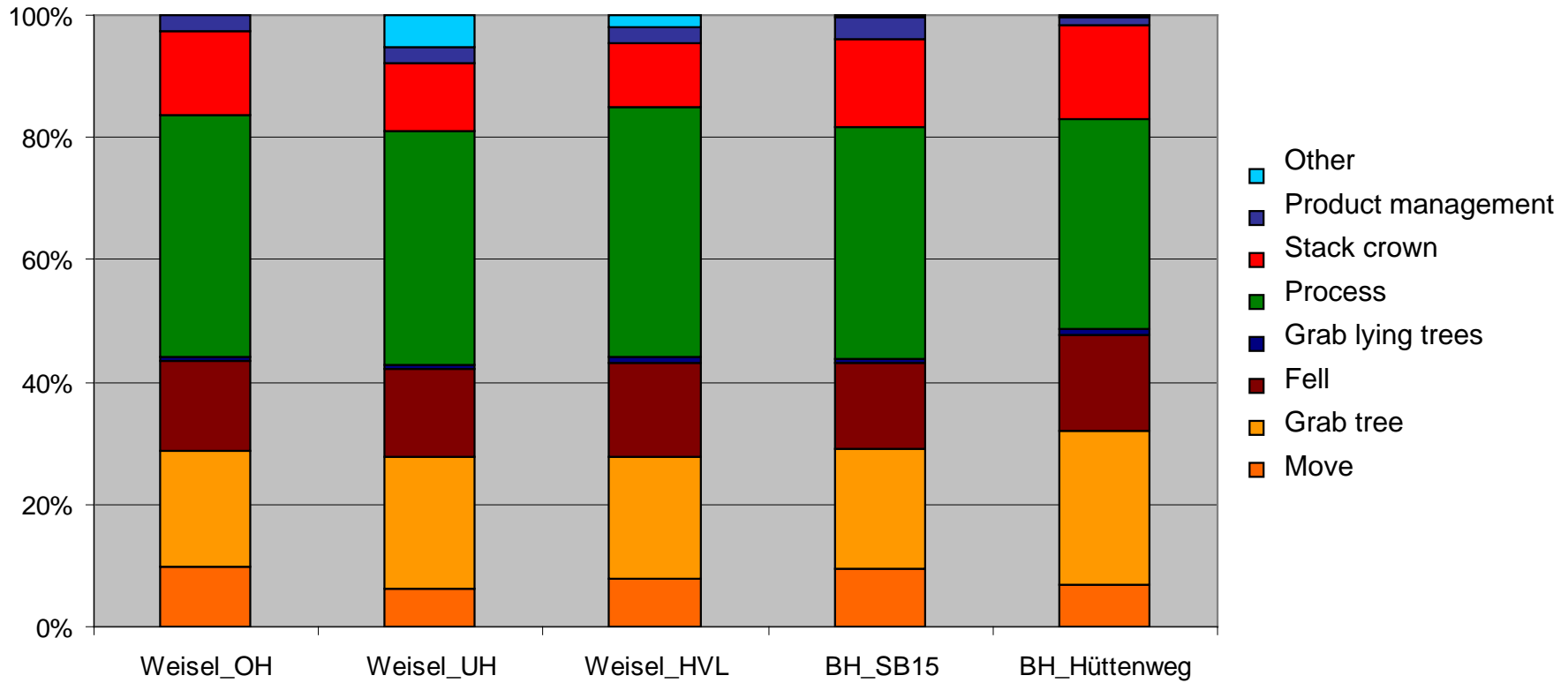
Absolute times (direct work time)



Results Harvester

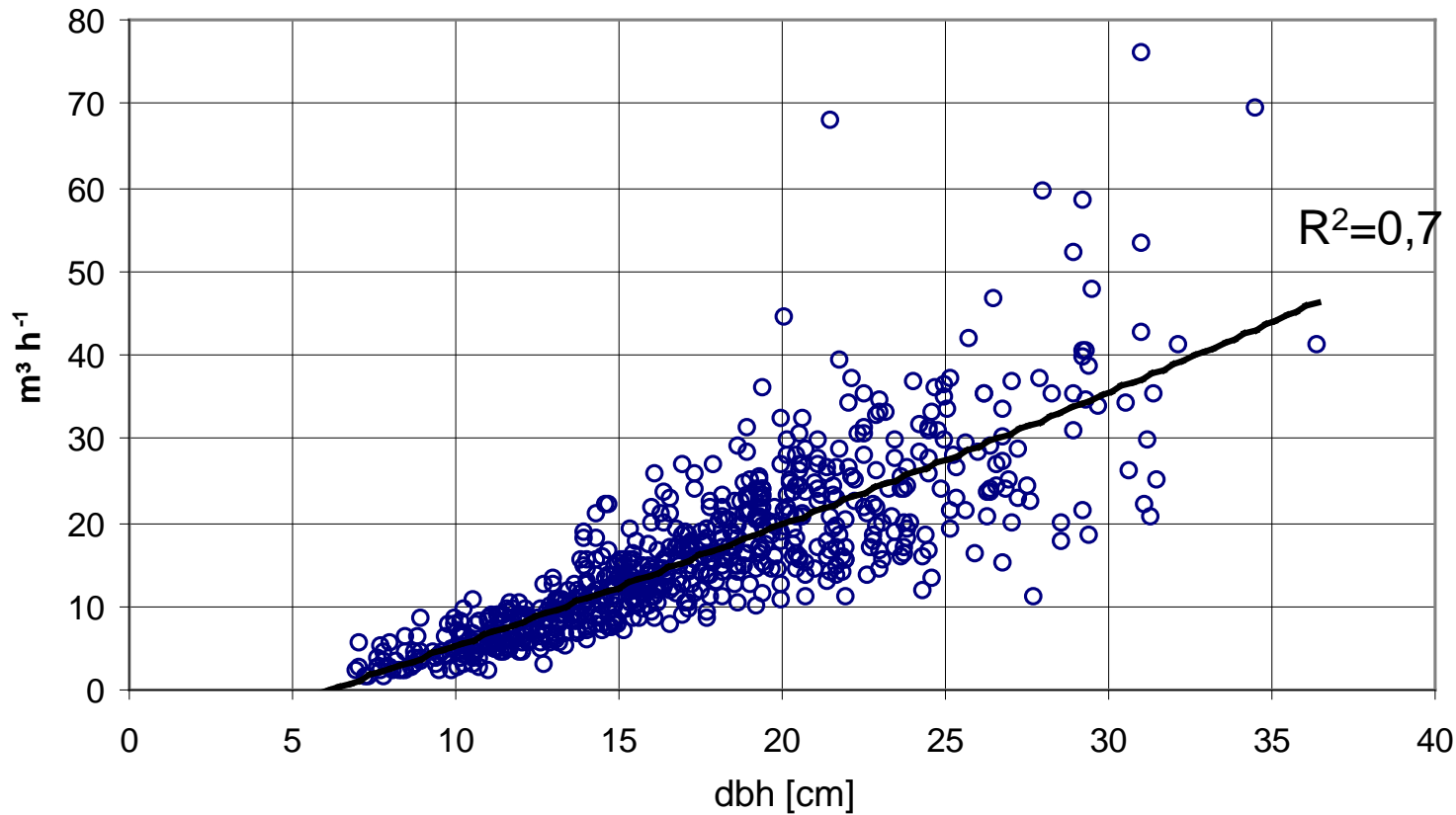


% of working cycle (direct work time)



dbh avr	Weisel_OH	Weisel_UH	Weisel_HVL	BH_SB15	BH_Hüttenweg
	20,4	17,2	17,8	17,9	15,4

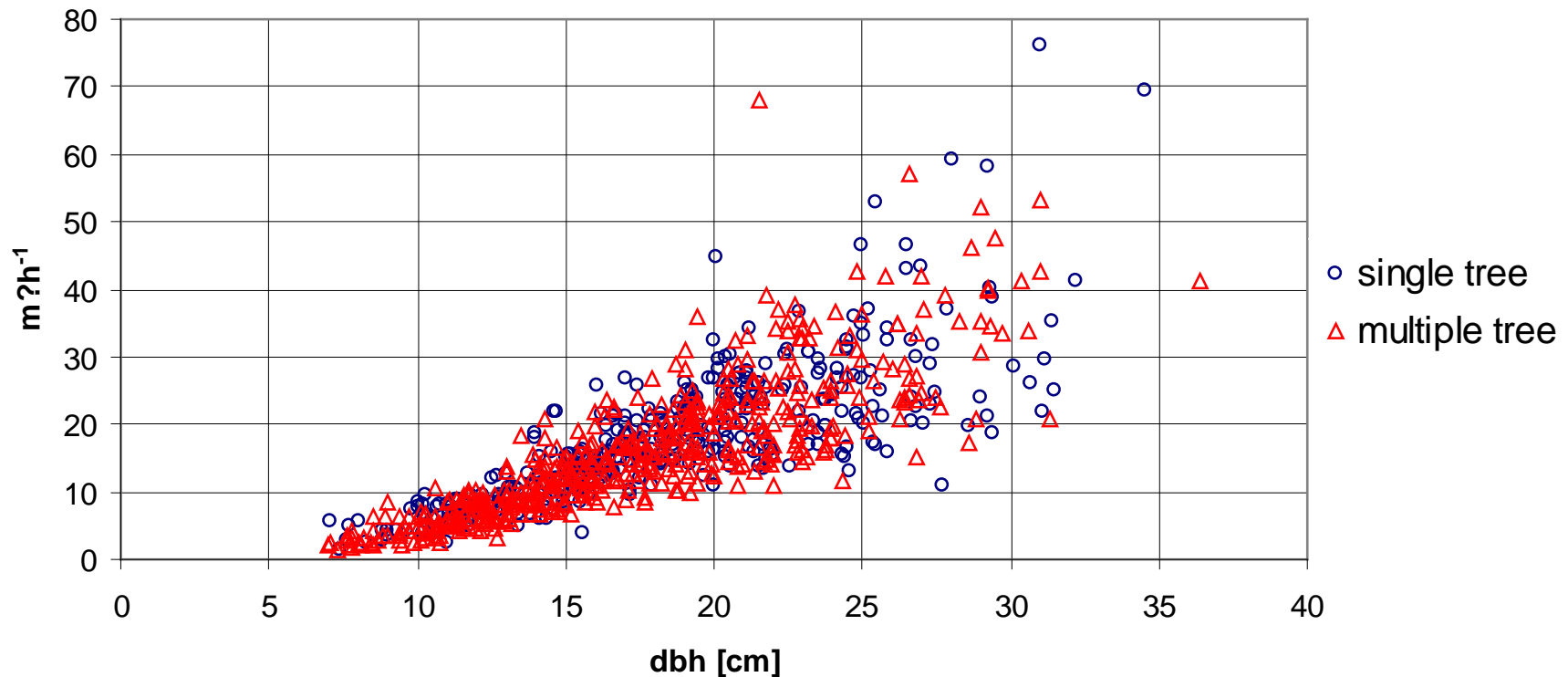
Productivity (direct work time)



Results harvester

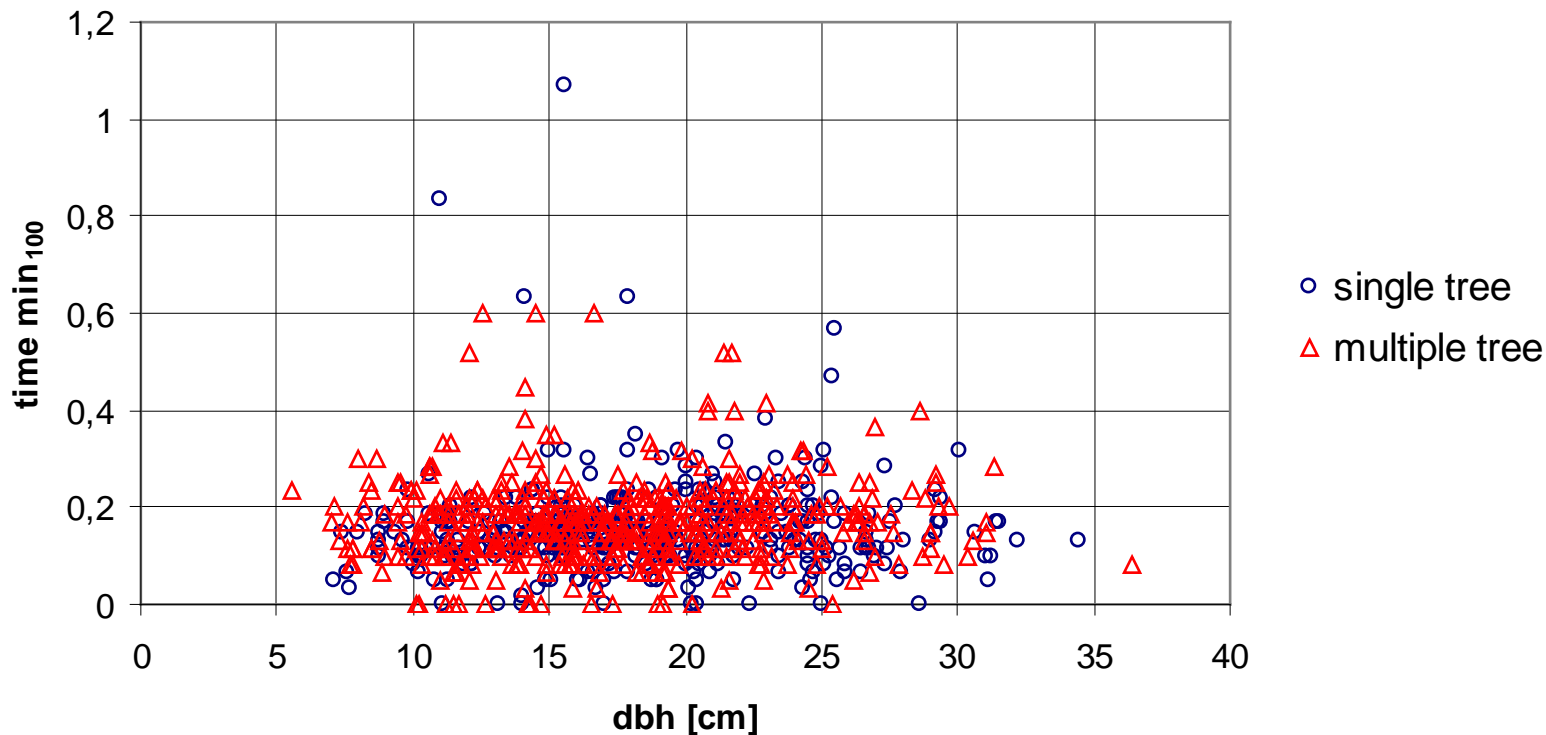


Differences single tree – multiple stem harvesting



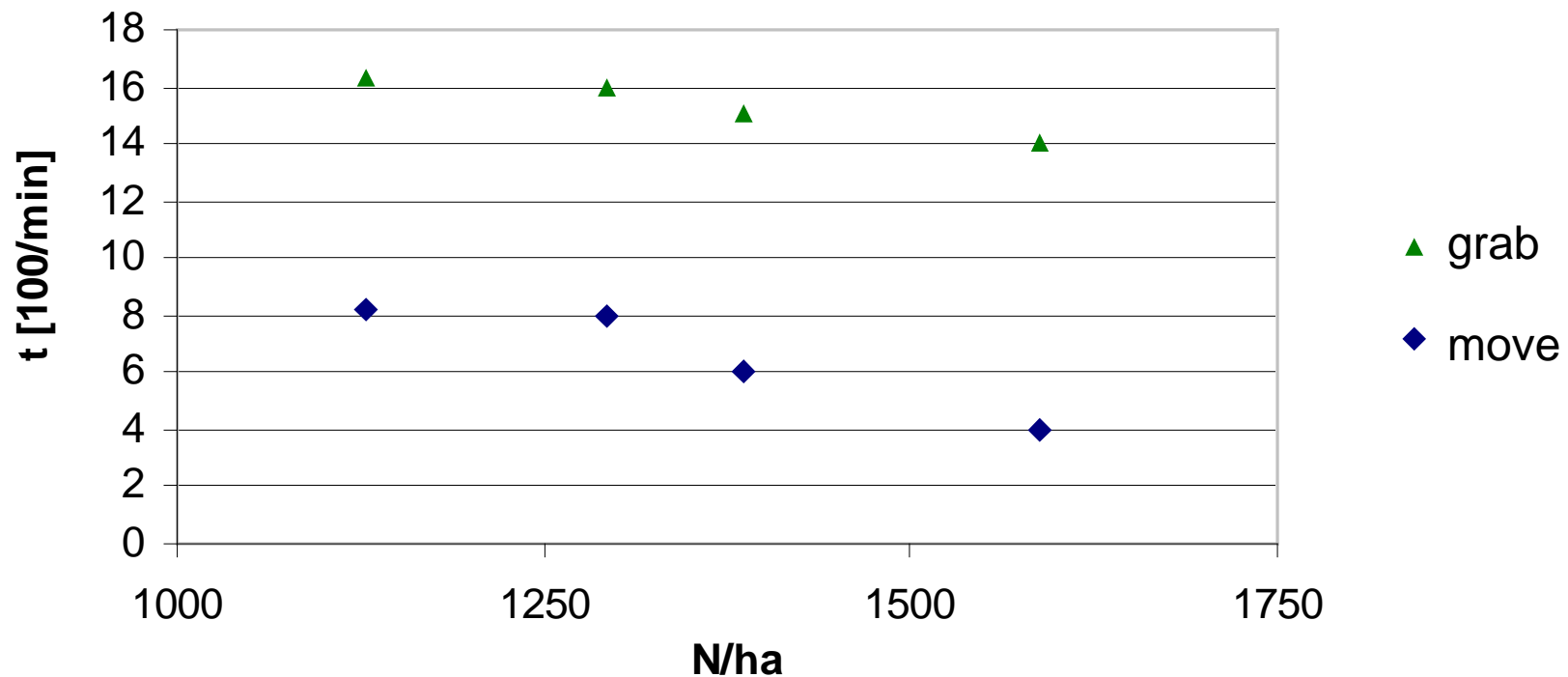
No difference in productivity

Differences „grab“ single tree – multiple tree



Statistical difference significant on level 0,05 between 0,6 and 1,5 sec.

Effect of stand density (trees/ha)



Results Forwarder



	Felled by Harvester	Felled motormanual
Move empty forest road	3,52	3,93
Move empty skidroad	1,38	1,53
Load	18,54	35,48
Move	0,65	4,79
Move loaded Skidroad	1,13	2,94
Move loaded forest road	3,4	4,15
Unload	8,62	8,73
Other	0,7	1,81
Sum	37,94	63,36

t in minutes (direct working time)

Financial Results



Nastätten

Felling harvester (145€/Std.)	23,3 h/ha	295 m ³ /ha	12,6 m ³ /h	11,51 €/m ³
Forwarder (80€/Std.)	30,3 h/ha	295 m ³ /ha	9,7 m ³ /h	8,25 €/m ³
Oak/hornbeam, avr. dbh: 18cm, 56% multiple stems				19,76 €/m³

Bundesforsten Baumholder

Felling harvester	18,8 h/ha	216 m ³ /ha	11,4 m ³ /h	12,71 €/m ³
Forwarder	25,9 h/ha	216 m ³ /ha	8,3 m ³ /h	9,64 €/m ³
Oak/hornbeam, avr. dbh : 16,6 cm, 60,2% multiple stems				22,35 €/Efm

proceeds: **32 €/Efm**

Conclusions



- It is possible to harvest hardwoods fullmechanised in bad quality stands
- No difference in productivity single stem – multiple stems
- But small differences in grabbing
- Economic



Thank you very much for your attention!

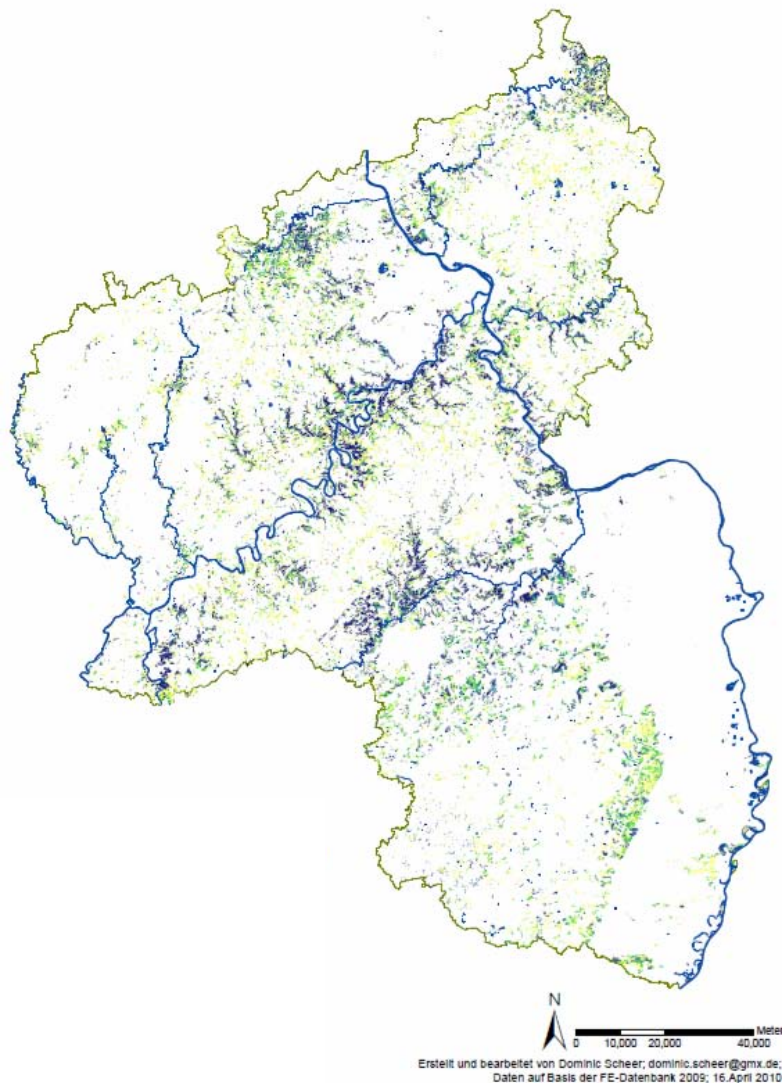
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Thanks to:

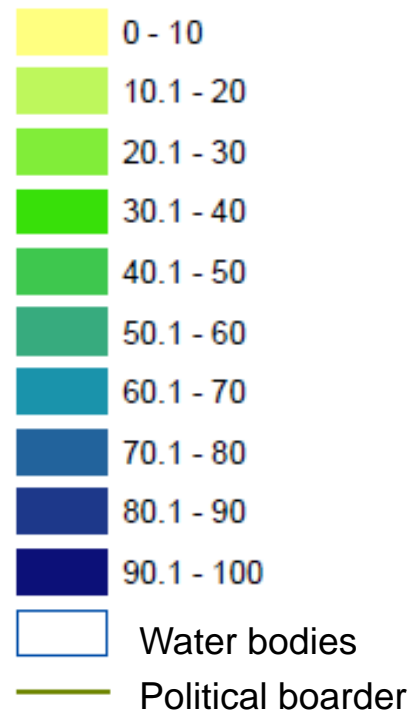


DAAD Deutscher Akademischer Austausch Dienst
German Academic Exchange Service

Study area Rhineland-Palatinate



% coppice of total forest area



source: SCHEER 2010

Coppice in Europe



	coppice	% of total forest area	source
France	4.714.000 ha	50,0 %	(BMELF 1982)
Belgium	174.000 ha	30,0 %	(BMELF 1982)
Austria	96.000 ha	1,7 %	(HOCHBICHLER 2008)
Germany	75.316 ha	0,7 %	(BWI ² 2004)
Italy	3.200.000 ha	54,5 %	(INFC 2005, FAO 2005)

- **Conservation through utilization:
Multifunctional development of overaged coppice
in Rhineland-Palatinate**
- August 1, 2008 – July 31, 2011
- Partner:
 - forest administration
Rhineland-Palatinate
 - Institute of Silviculture
 - Institute for Landscape Management
 - Institute of Forest Utilization and Work Science

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Coppice-Projekt R1P

