



# Logistic chains for wood chips from short rotation forestry

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Highlights der Bioenergieforschung  
Wieselburg, March 31<sup>st</sup>, 2011

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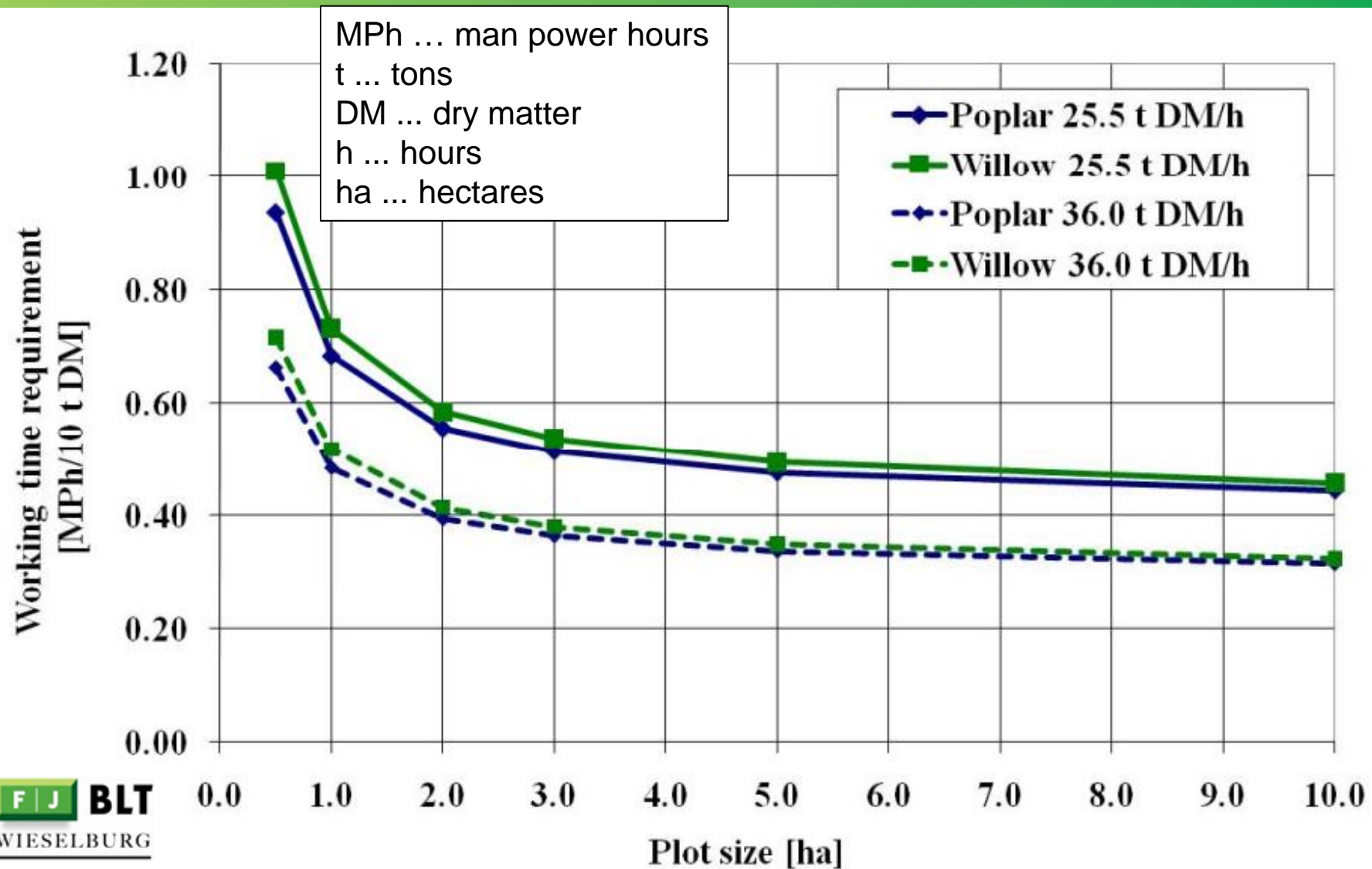
# Harvesting

- Forage harvester (Claas Jaguar 890 - 370 kW) equipped with a special header (Biomasse Europa)
  - Theoretical cutting length: 34 mm
  - Maximum diameter of trunks: 13 cm
  - Working width: 120 cm





# Results - Working time requirement - Harvester



Mass flow related to effective chopping time

# Transport

## Chain 1:

- Tractor-pulled trailers directly transport the wood chips from the field to the storage.
- Types of trailers:
  - 2- or 3-side tippers
  - Body tippers
  - Push-off trailers
  - Silage trailers
- Loading space: 19 – 40 m<sup>3</sup>



# Transport



## Chain 2:

- Tractor-pulled trailers transport the wood chips from the field to an interim storage near the field.
- The transport from the interim storage to the storage is carried out by articulated lorries or road trains.
- A wheel loader or telehandler loads the lorries.





# Transport



## Chain 3:

- Tractor-pulled adapted field transfer trailers transport the wood chips from the field to the articulated lorries or roadtrains.
- By means of an auger the field transfer trailers directly load the wood chips on the lorries.
- The lorries transport the wood chips to the storage



# Transport



## Chain 4:

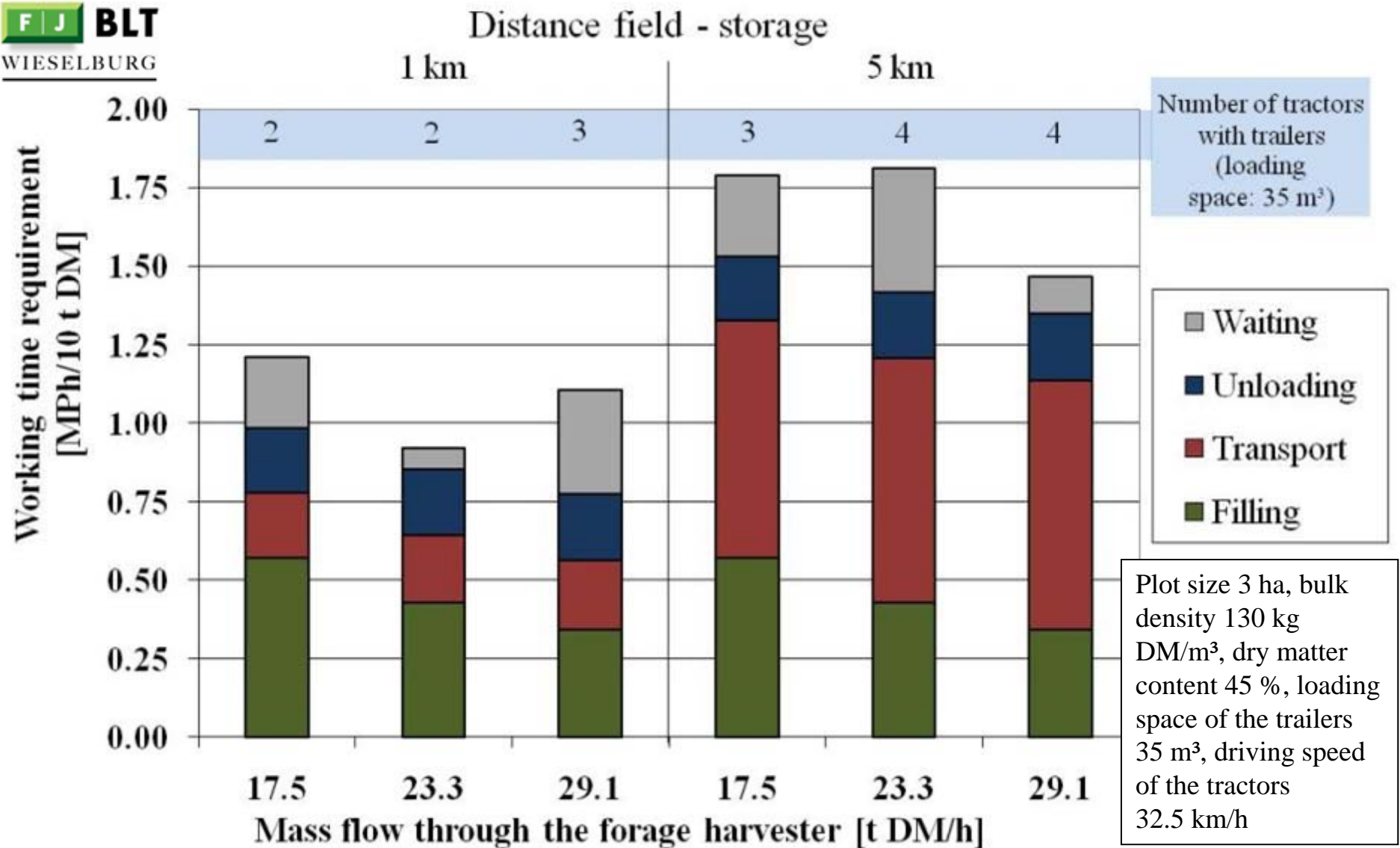
- Tractor-pulled hook lift trailers transport the wood chips from the field to an interim storage for the containers near the field.
- At the interim storage two loaded containers are picked up by a hook lift lorry and are transported to the storage.



# Working time requirement for transport from field to storage



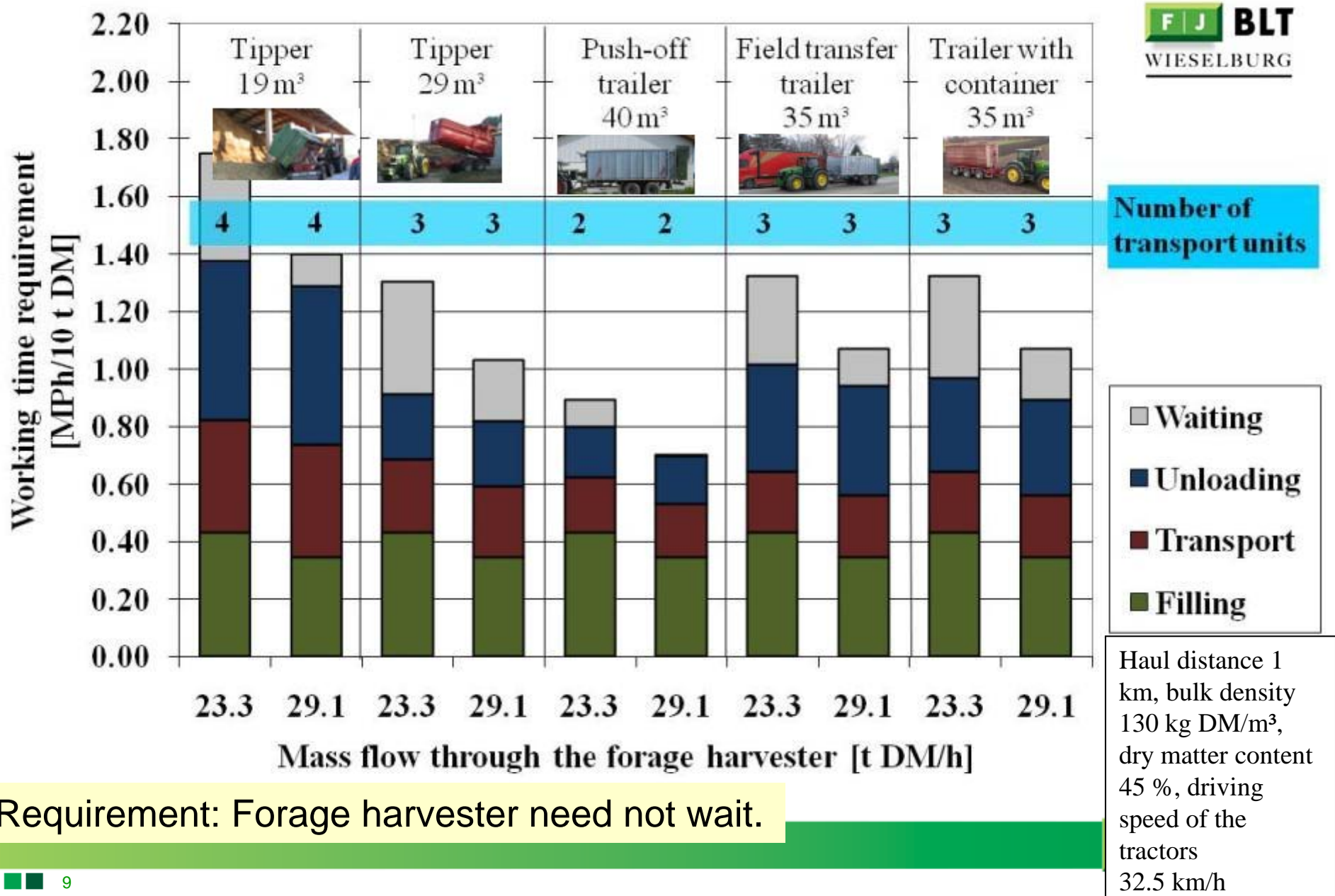
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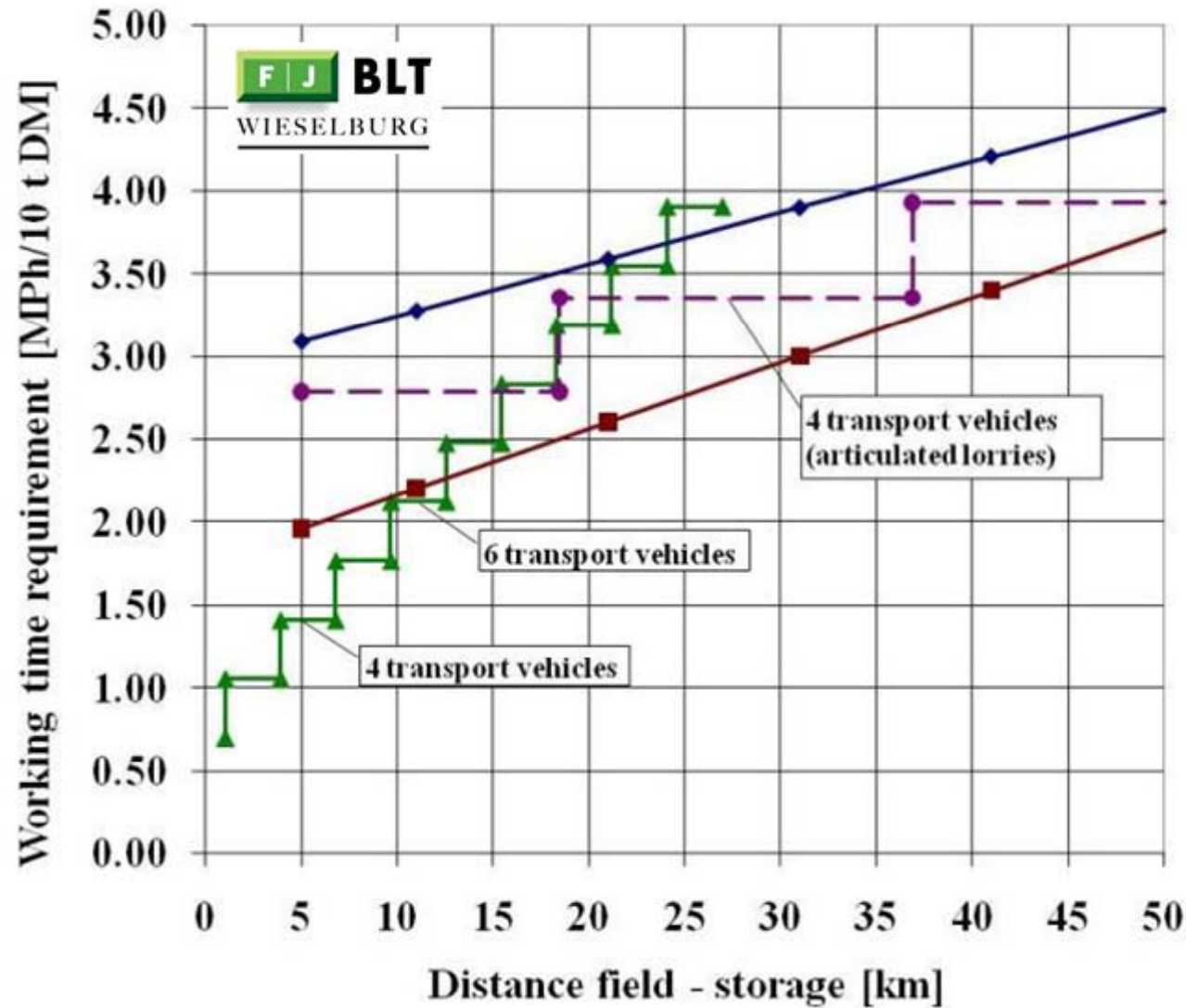
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# Transport: Field – interim storage



# Transport: Field – storage



Chain 1: Tractor pulled trailer 40 m<sup>3</sup>



Chain 2: Tipper 19 m<sup>3</sup>, articulated lorry 90 m<sup>3</sup>



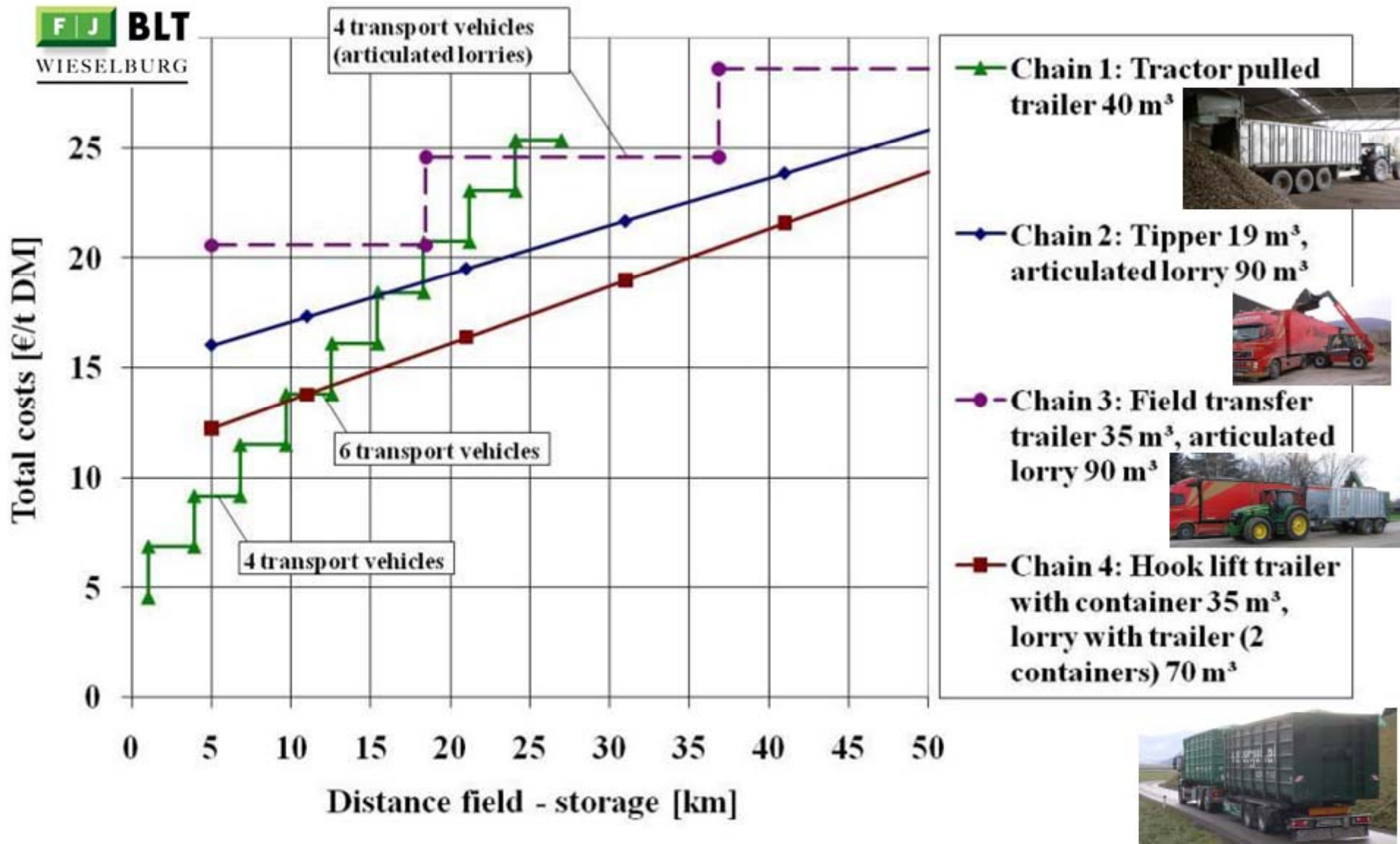
Chain 3: Field transfer trailer 35 m<sup>3</sup>, articulated lorry 90 m<sup>3</sup>



Chain 4: Hook lift trailer with container 35 m<sup>3</sup>, lorry with trailer (2 containers) 70 m<sup>3</sup>



# Transport: Field – storage





# Conclusions



- ❖ A lower working time requirement for chopping causes a lower working time requirement for transport of wood chips
- ❖ The working time requirement for transport corresponds to the loading space of the trailers and to the transport distance.
- ❖ Because of the high costs idle time of the harvester should be avoided. This requirement causes idle time of the transport vehicles.
- ❖ The degree of utilization of the transport chain determines the idle time of the transport vehicles.

# Conclusions



- ❖ The degree of utilization of the transport chains is mainly determined by
  - mass flow through the harvester
  - transport distance
  - speed and loading space of transport vehicles
- ❖ The direct transport from field to storage by a tractor with trailer is the most time and cost effective way to transport wood chips up to a distance of 10 to 15 km.
- ❖ For larger distances the use of containers is the most time and cost effective way. (containers act as buffer → enough containers must be available)



# Are there any questions?





# Related publications



- ❖ HANDLER F., BLUMAUER E.: Arbeitswissenschaftlicher Vergleich verschiedener Systeme zum Setzen von Stecklingen zur Anlage von Kurzumtriebsflächen. Bornimer Agrartechnische Berichte, Heft 66/2009, S. 144-156.
- ❖ HANDLER F., BLUMAUER E.: Analysis of working time requirement and logistics for growing short rotation forestry (SRF) in Austria. Proceedings of XXXIII CIOSTA CIGR V Conference 2009 "Technology and Management to Ensure Sustainable Agriculture, Agro Systems, Forestry and Safety", 17 - 19 June 2009, Reggio Calabria, p. 2233-2237.
- ❖ HANDLER F., BLUMAUER E.: Logistics chains for wood chips from short rotation forestry. Proceedings of International Conference on Agricultural Engineering AgEng 2010, Clermont-Ferrand, 6 - 8 September 2010.
- ❖ HANDLER F., BLUMAUER E.: Hackgutlogistik bei der Ernte von Kurzumtriebsflächen mit einem Feldhäcksler. Tagungsband zum 4. Rostocker Bioenergieforum "Zukunftstechnologie für Bioenergie", 27. - 28. Oktober 2010, Rostock, S. 91-101.
- ❖ HANDLER F., BLUMAUER E.: Arbeitszeitbedarf für die Ernte von Kurzumtriebsflächen. Tagungsband zum 17. Arbeitswissenschaftlichen Kolloquium des VDI-MEG Fachausschusses Arbeitswissenschaften im Landbau, 14.-15. März 2011, Weihenstephan, ISBN 978-3-00-034001-7, S. 32 – 42.



## Ifz FRANCISCO JOSEPHINUM WIESELBURG BLT - BIOMASS | LOGISTICS | TECHNOLOGY

BLT is the research department of the HBLFA Francisco Josephinum. The main activities are:

- Testing and development of agricultural machinery
- Analyzing and development of agricultural processes
- Research in area of the energetic use of solid and liquid biofuels

Franz Handler

Head of the department process engineering

Main tasks:

- Working time requirement and logistics in agriculture
- Mechanization in hillside farming
- Processes for producing biomass