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Flat and wet: Cable yarding on sensitive soils in Europe – motivations, challenges and potential

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Globally increasing demand for renewable material from forests forest resources for material and energy purposes (Lindahl and Westholm 2011)

Environmental awareness has grown over time and tolerance for soil disturbance has decreased (Abbas et al. 2018)

Window of opportunity for effective ground-based extraction on frozen soils shortens due to global warming (Goltsev and Lopatin 2013, Mohtashami et al. 2017, Daniel et al. 2018, Lehtonen et al. 2019)
Goal of the study

Draw a first general picture about the actual and potential use of cable yarding technology on flat terrain, starting from the manufacturers of such technology:

- Investigate manufacturer’s experience with customers working on flat terrain
- Explore their opinion concerning the particular challenges of cable yarding on flat terrain and where they see adaptation potential
- Learn about their view of cable yarding’s future potential on flat terrain and the main hurdles for expanding its use under these conditions
Material & Methods

- Company figures
- Customer experience
- Specific challenges and adaptation potential
- Future potential

Interview form
Interviews
Interview files
Categorization and analysis

Source: Holzleitner
Customer experience

- All but one company received customer requests concerning yarding on flat terrain in the past; all but two concerning flat and wet terrain.
- Germany was most frequently named country of request origin, followed by Russia and Italy.

![Image of a crane and trees with text: Source: Holzleitner]
Customer activities and motivation

- **Regulatory reasons** included restrictions to ground-based machine traffic imposed by **nature conservation** or **watershed protection** measures, as well as **governmental interventions**, i.e. subsidies to support low-impact harvesting.

- **Environmental considerations** referred to **cable yarding on areas otherwise accessible** to ground-based alternatives.

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**Customer activities**

- flat and wet terrain in forestry: 10 respondents
- flat and wet terrain in forestry & construction: 1 respondent
- flat terrain in construction: 2 respondents
- not aware of any: 2 respondents

**Customer motivation**

- Permanent or temporarily inaccessibility: 45% respondents
- Regulatory reasons: 32% respondents
- Environmental considerations: 23% respondents

n=22
Specific challenges (and opportunities)

- Lack of clearance
- Shorter spans / more intermediate supports required
- Higher installation time consumption and costs
- Longer spans / fewer supports required
- Artificial anchors / supports / tail spars required
- Terrain allows to take machines on site for anchoring / anchor building and felling / pre-bunching

Source: Haberl
Adaptation potential

Better / more widespread use of existing technology (39 % of responses)

- Artificial (machine) anchors
- Running skyline systems
- Yarder technology
- Self-propelled ground-carriage
- Self-propelled carriages
- Mechanized pre-bunching
- Grapple carriages
- Radio controlled chokers
- Water-proof footwear

Source: Forsttechnik
Source: Leitner
Source: Holzleitner
Adaptation potential

Adaptation of existing technology (28% of responses)

- Self-anchoring by machine weight
- Longer / synthetic guylines
- Mobile artificial lattice intermediate supports / tail spars
- Increased tower height
- Lighter (self-propelled) carriages
- Longer chokers for pre-bunched loads

Source: Holzleitner
Adaptation potential

Introduction of new purpose-built devices (33% of responses)

Highly mobile artificial tail spar with following specifications:

- Tower of “canopy height”, which allows to forego intermediate supports
- Anchoring by weight to abstain from anchors
- Tracked carrier to be mobile on wet terrain
- Auxiliary winch to pull out skyline to facilitate installation

Operates on connection paths parallel to forest road where cable yarder is stationed

Excavator base machine was considered a cheap and versatile option for being able to free itself when stuck
Future potential and main hurdles

**Economic hurdle**
- High installation costs
- Operation costs not competitive to ground-based alternatives
- High acquisition costs (especially for farmers)
- Low productivity due to lack of pre-bunching
- Lack of operability during night

**Social hurdle**
- Severe shortage of qualified and motivated personnel
- Unattractive work conditions and environment
- Competition for workforce with construction industry
- Cancellation of anticipated machine purchases due to lack of workforce

**Expansion potential**

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- **Yes**
- **Unsure/depends**
- **No**
Land cover type, terrain slope and soil type susceptibility to groundwater influence were considered to determine potential areas (1 pixel = 25 hectares).

Forest structure data from national inventories provided volume on potential areas.

Nature conservation areas were excluded from analysis.

Potential map

9.5% of the forested area

3.7% of the stocking volume

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Conclusions

- **Majority** of manufacturers **received requests** for flat and wet terrain technology in the past and **Germany** is the “**hot spot**” of requests; **existing technology** consists of **generic all-terrain solutions**

- **Operation** on flat and wet terrain is **not limited to forestry** and **terrain accessibility** is the **most frequent motivation**, followed by **regulatory reasons** and **environmental considerations**

- **Lack of clearance** and **suitable anchors / intermediate supports / tails spar trees** are major challenges and overcoming **incurs additional costs**

- **Adaptation potential** can be realized by **new ways to employ existing technology**, **adapting existing technology** and **introducing new technology** (tall, mobile, self-anchoring artificial tail spar)

- **Cable yarding on flat and wet terrain might expand** the future, but is limited by **economic** and **social hurdles** that are typical for cable yarding (and forestry as a whole). Though certainly a **niche**, it might have a shot in the future, **not where ground-based alternatives can be employed** with acceptable damage to soil, **but everywhere, where this is not the case.**
Cited literature

Consortium

Research institutes and universities
- NIBIO
- RS3
- University of Natural Resources and Life Sciences, Vienna
- CNR-IVALSA
- University of Copenhagen
- EFI
- Georg August Universität Göttingen
- Luke
- Mösle
- McKee
- University of Leuven
- University of Padua
- University of São Paulo

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- Na Na Tiwoc
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Machine manufacturers and SMEs
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