Harvester and Forwarder on Steep Slopes - The European Perspective

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Roadmap

Why Europeans want to move harvester and forwarder operations to steep terrain?

Results of a pilot study with tension monitoring and productivity analyses

(Unsolved) problems & future challenges
Mechanized timber harvesting
Cost comparison

- **Harvester and Forwarder**
  - Final cut: 23
  - Thinning: 32

- **Cable Assist Harvester and Forwarder**
  - Final cut: 26
  - Thinning: 43

- **Chain Saw and Tower Yarder with Processor**
  - Final cut: 39
  - Thinning: 64

Harvesting costs [Canadian Dollar/m³]
Working accidents
Chain saw versus harvester

Source: Niedersächsische Landesforste
More reasons for pushing new technologies onto steep slopes

- Discussions about state of the art „whole tree cable yarding“ technology in steep terrain (nutrient loss, residual stand damage, working accidents).
- Lack of qualified workforce for harvesting with the chain saw.
- Considerable thinning requirements in steep terrain.
Steep terrain harvester
Harvester and forwarder integrated winch systems

HAAS HIGHGRADE (JOHN DEERE)

HERZOG ALPINE SYNCHROWINCH (PONSSE)

KOMATSU SPW

HSM FORCE-SYNCHRO DRIVE HSW 15
Anchor machine winch systems

ECOFORST T-WINCH

HAAS UNI WINCH

HERZOG SYNCHROWINCH MW500
Installation time for the traction aid cable

![Diagram showing productive working time (PSH₁₅) for different slopes and trial lengths.](image)
Cable assist harvester
Tension example

2 tension ranges
uphill
downhill

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Cable assist forwarder
Tension & slope

Cable tension

Slope

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Cable assist forwarder
Tensions during loading

machine driving

crane work

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Cable assist harvester productivity

Thinning operation
- Number of trees felled per stop (n): 2.8
- Soil bearing capacity (% CBR): 2.5
..... the machine must remain stable and have traction without cable assist.
Harvester operating range

Terrain slope (%)

3%
>3%

Soil bearing capacity (% CBR)

NZ Critical Area
Very Critical Area
Critical Area
Definition of risk zones
Cable assist harvester and forwarder are efficient harvesting systems for steep slopes (thinning and clear cut).

Still discussion about the operating limits with this technology. A European standard for cable assist harvester and forwarder on steep slopes is in preparation.

We have to adapt and improve the quality of the existing safety guidelines.

Tree anchors fail often in small sized thinning stands.
Thank you for your attention!