

FEC 2018: Quenching our thirst for new Knowledge April 16<sup>th</sup>-19<sup>th</sup>, 2018 Rotorua, New Zealand



## Modern Steep Terrain Harvesting in Central Europe

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### Roadmap





## European harvesting systems for steep terrain



## Why we need mechanization on steep terrain?



(Unsolved) problems & future challenges

## Chain saw, tower yarder and processor (Whole-tree)







## Harvester and cable-forwarder (Cut-to-length)





## Tethered harvester and forwarder (Cut-to-length)









# Harvester and radio-controlled trailer (Cut-to-length)







# Chain saw, excavator with winch and processor (whole tree)



# Tower yarder manufacturer in Europe





## 15 manufactures 63 models 7 countries

Source: Wassermann, 2018

### **Tower yarder carriers (1)**





#### trailer

truck



tractor





### **Tower yarder carriers (2)**





#### excavator



### Tower yarder specifications Change over time





## Mechanized timber harvesting Cost comparison



### Working accidents Chain saw versus harvester







### **Steep terrain harvester**





## Harvester and forwarder integrated winch systems





# Anchor machine winch systems











## ..... the machine must remain stable and have traction without cable assist.



### Outlook





- Whole tree cable yarding will play a major role for timber harvesting in steep terrain.
- Cable assist harvester and forwarder are efficient harvesting systems for steep slopes (thinning and clear cut operations).
- Still discussion about the operating limits with this technology.
- Tree anchors fail often in small sized thinning stands.

### Thank you for your attention!



