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## Using ground-based harvesting machinery on steep slopes; how steep can we go?

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**Abstract:**

*Harvesting timber on steep terrain is inherently difficult. Specialized steep terrain harvesting systems such as cable or helicopter extraction are well developed, but considerably more expensive than ground-based systems. These specialized systems also rely on manual workers, such as motor-manual felling and setting chokers, whereby an overall emphasis in the industry is to mechanize where possible to improve both cost-effectiveness as well as safety. As such there is considerable emphasis on the development of new ground-based machinery for steep terrain.*

*Operating machines on steep slopes increases the risk of machine roll-over. Most countries have safety rules or codes of practices that include slope limits, but the reality is that the new machines often exceed these limits. This research project measures real time machine slope gradients under normal operating conditions, and through the use of GPS, correlates it to terrain slope. Important results are not just the maximum slope gradients and their relationship to safety limits, but also to see if different machine types experience different slope values relative to the terrain. The machines type being tested include those with different functions such as felling, bunching and extraction, but also a comparison of excavator-based machines in New Zealand with the more purpose built steep terrain machines in central Europe.*

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