Improvements in forest resources planning and mobilization:

- **Advanced planning and support tools for forest management**
- **Machinery innovations in slope areas**

Lleida, February, 12th 2020

Unió Europea
Fons Europeu de Desenvolupament Regional

Generalitat de Catalunya

CTFC

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IMPROVEMENTS IN MOUNTAIN FOREST RESOURCE PLANNING

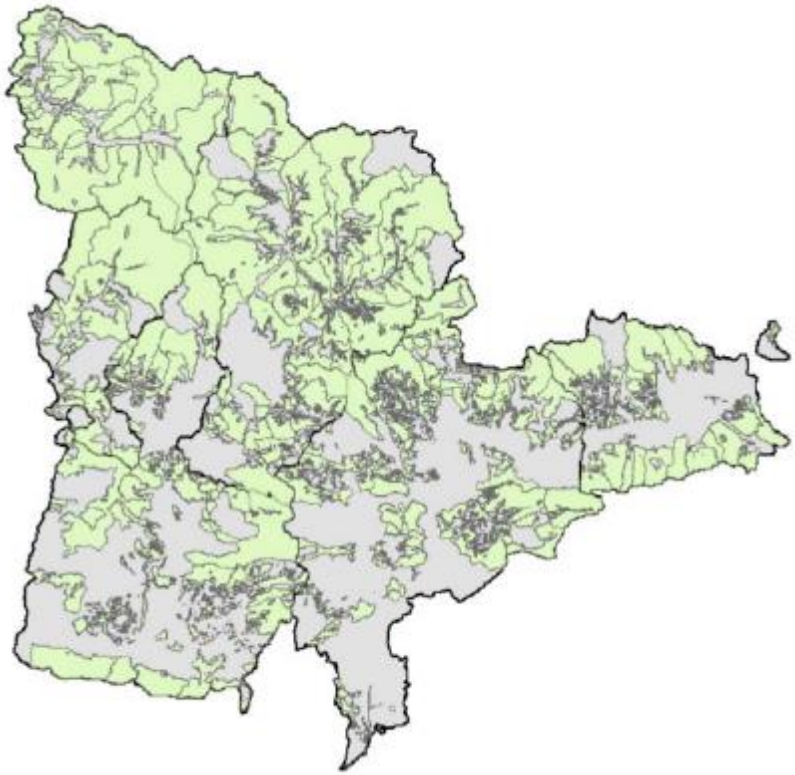
Goals

- To study the real planning situation of the municipal mountains of Lleida, and to make a diagnosis of the suitability of these documents, which are essential for managing and improving the public mountains of Lleida (action 1).
- To have the best methodology and the best information and communication technology to carry out the management plans of these mountains.
- To relate in an agile and innovative way municipal owners, managers, administrative structure and companies. To test the preparation and operation of these projects (actions 2, 3 and 4).

IMPROVEMENTS IN MOUNTAIN FOREST RESOURCE PLANNING

1. Study of public mountain management plans. Monitoring and suitability.

- Conducting a research work on all the management plans approved in the area of Lleida, to check their suitability, degree of execution, possible causes that determine the execution and need for review and/or to make new ones.
- Developing an action plan for the planning and management of the public mountains of Lleida.

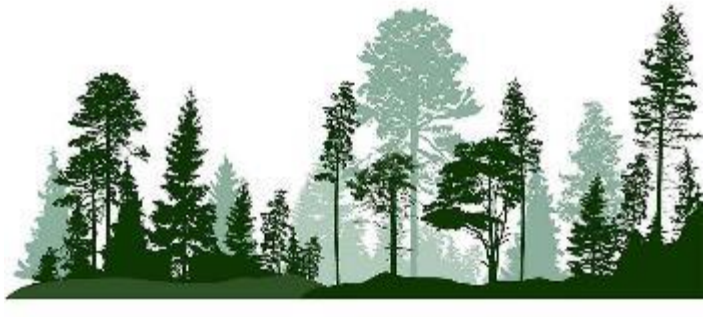


The analysed regions have been: Alt Urgell, Alta Ribagorça, Cerdanya, Pallars Jussà and Pallars Sobirà. These regions have an amount of 418 public forests that represent 263.737 ha. During the years 1996-2018, 220.161 ha, distributed in 331 forests, have been planned (83,47 % of the forests).

IMPROVEMENTS IN MOUNTAIN FOREST RESOURCE PLANNING

2. Platform through websites and computer program to track the public forests

- Study of the existint programs and platforms designed for large property forest management.
- Development and/or adaptation of a platform-program that facilitates the elaboration, monitoring and implementation of management plans, and that provides immediate information to owners, companies and administrations.



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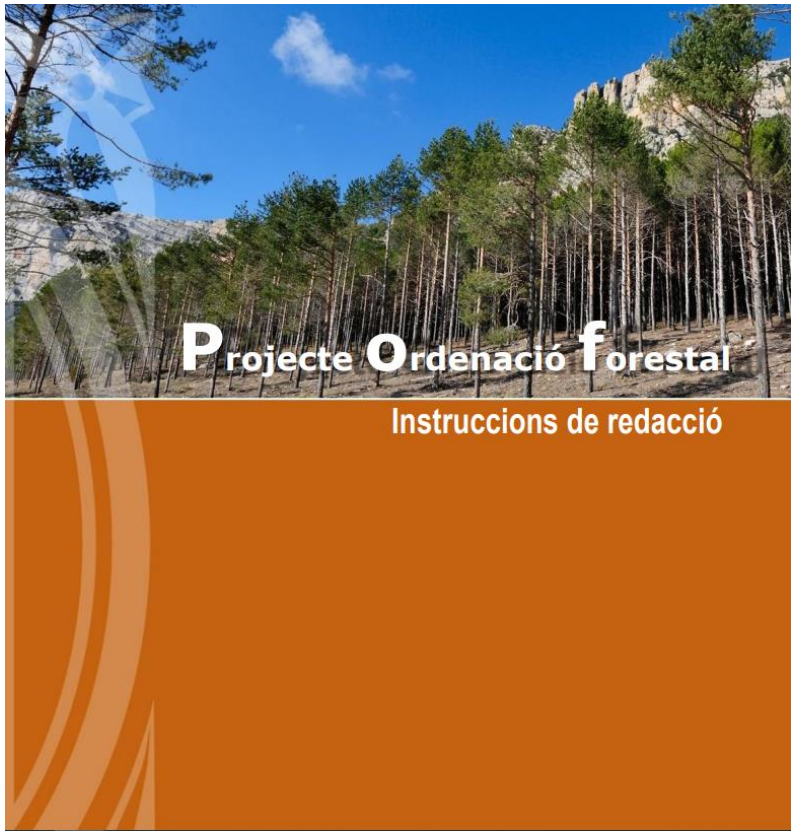
3. Adaptation of forest management tools.

- Adaptation and simplifaction of management plans.

- Revision/preparation of a manual to direct the elaboration of public forest management plans, integrating the tool developed in 2.



IMPROVEMENTS IN MOUNTAIN FOREST RESOURCE PLANNING

4. Development of simplified experimental management plans

Several experimental plans will be developed in each region to test and start-up the new management methodology and technology.

During the process, there will be monitoring and orientation.

TECHNOLOGICAL INNOVATION IN SLOPE HARVESTING

- **Cable yarder for timber logging**
- **Timber processor**
- **Synchrowinch machinery**
- **Dual winch with steel wire & synthetic rope**

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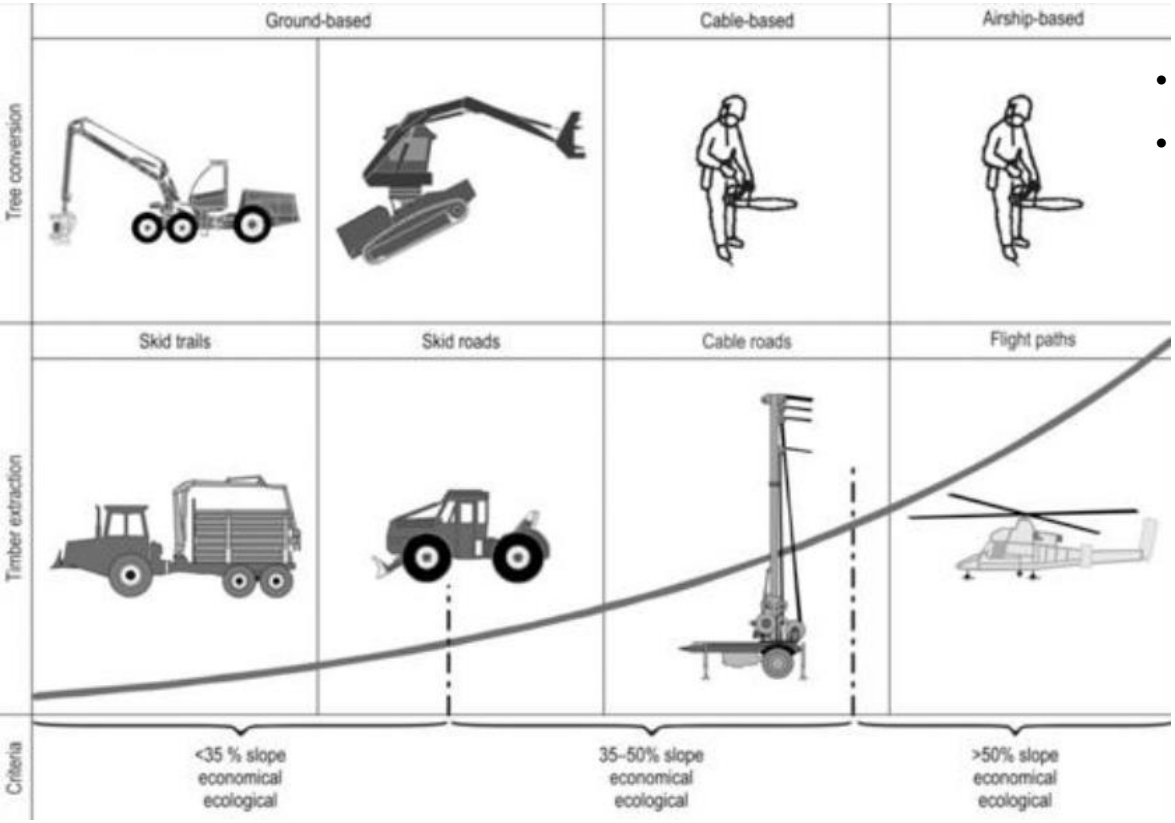
Purchase of experimental set of cable yarder and processor

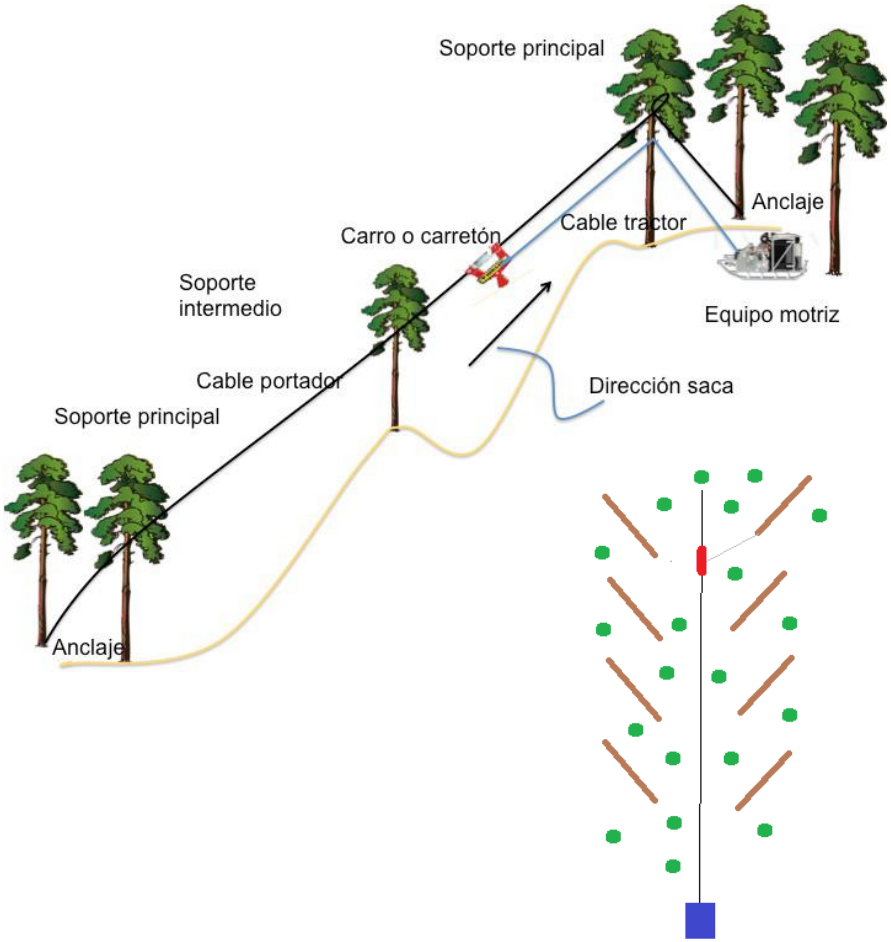
Cable yarder for logging: where and why?

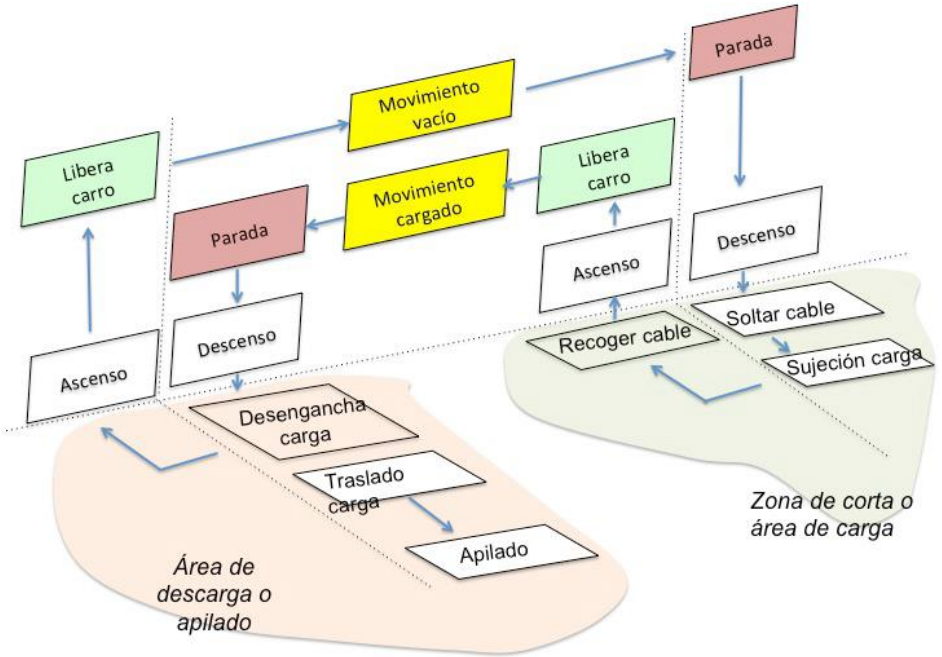


Reasons to use cable yarder

- steep and/or high-slope forest
- protected or fragile areas
- temporary or permanent flooding areas
- forests with low road density and restrictions for building them
- areas affected by natural disasters
- forest with valuable wood

Logging by cable yarder





Cable yarder productivity

Experiències realitzades en bosc alt					
Referències bibliogràfiques	Domenjó, I., 2011	Ambrosio et al, 1998	Ozturk T., 2009	Picchi, 2018	Navarro i Picchi, 2017
Espècies	Pi negral	Pi roig	Avet i pi roig	Avet	Avet i castanyer
Tipus d'instal·lació	Tricable	Tricable	Tricable	Tricable	Bicable grua
Llargària mitja de la línia (m)	100-150	75	600	-	43
Rendiment desembosc (m³/h)	**5**	**5,5**	**10,08**	**11**	**11,76**

Característiques del sistema de desembosc amb cable aeri en la demostració realitzada a Pont de Suert

Torre	Marca Greifenberg, model SIBERIAN	
Carro	Greifenberg CRG 15	
Treballadors	2	
Longitud de línia	150	
Situació	Tota la línia	
Nombre de cicles	34	
	Mitjana	Desviació típica
Viatge buit (minuts)	0:28	0:27
Descens del cable + carga (minuts)	1:57	1:46
Viatge horitzontal (minuts)	1:37	2:09
Viatge carregat (minuts)	0:57	1:37
Descàrrega (minuts)	0:20	0:10
TOTAL CICLE (minuts)	**5:19**	**1:34**
Volum/cicle (m³)	**0,32**	**0,21**
Pes/cicle (t)*	0,26	0,17
Distància horitzontal (m)	18,09	9,05
Distància desplaçament carro (m)	34,23	34,59
Velocitat del carro carregat (m/s)	0,60	0,49
Velocitat del carro descarregat (m/s)	1,22	0,71
Productivitat (m³/h)	7,9	**10,11**
Productivitat (cicles amb desplaçament del carro) (m³/h)	3,8	4,83

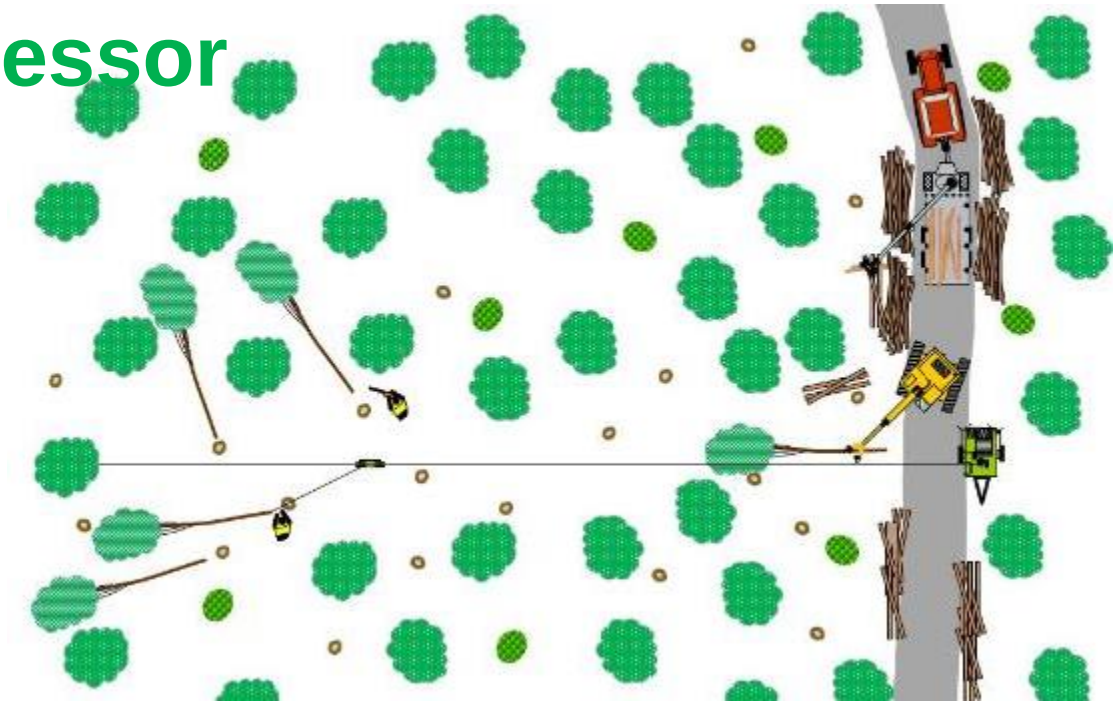
Densitat al 50% d'humitat de 0,81 $t_{50\%}/m^3$ per *Pinus sylvestris* (CTFC-AFiB)

Timber processor

Advantages of cable yarder and excavator/processor set:

Tapio 400 EXS

Arbro 1000



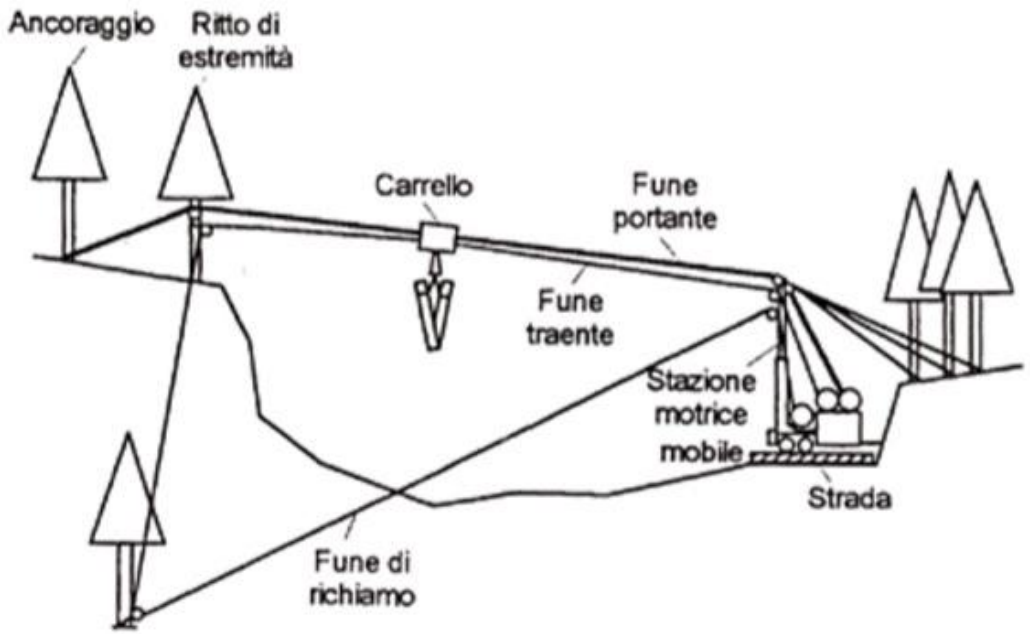
- **Better harvesting with a not so high investment**
- **Processor is easy to assemble on an excavator or a tractor crane**
- **Telescopic log processor are cheaper and with enough power**

Cable yarder bought by CTFC

Producer: Greifenberg

Model: SIBERIAN

Tricable with automàtic carriage



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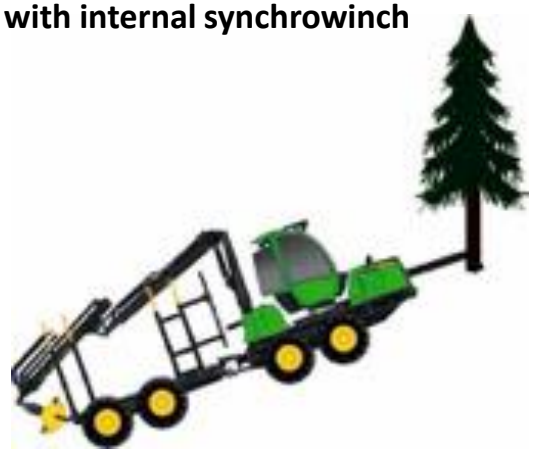
Experimental trials on machinery with synchrowinch

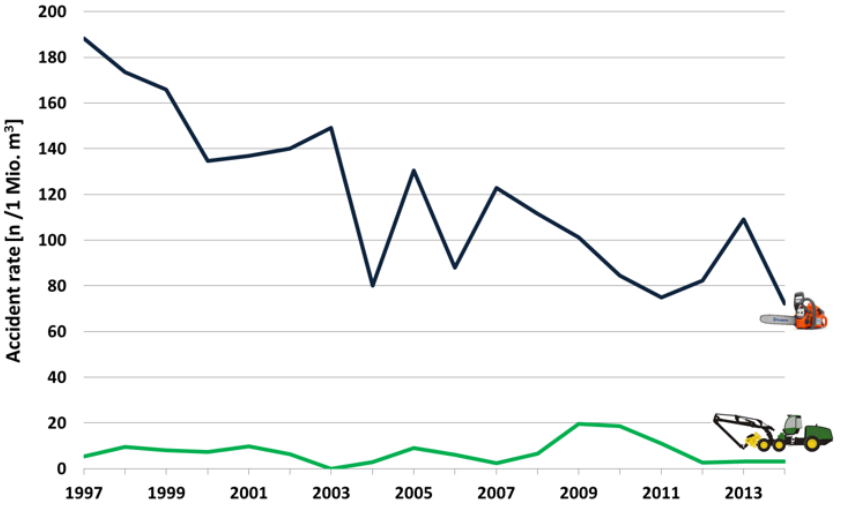
Synchrowinch

Machinery with internal synchrowinch

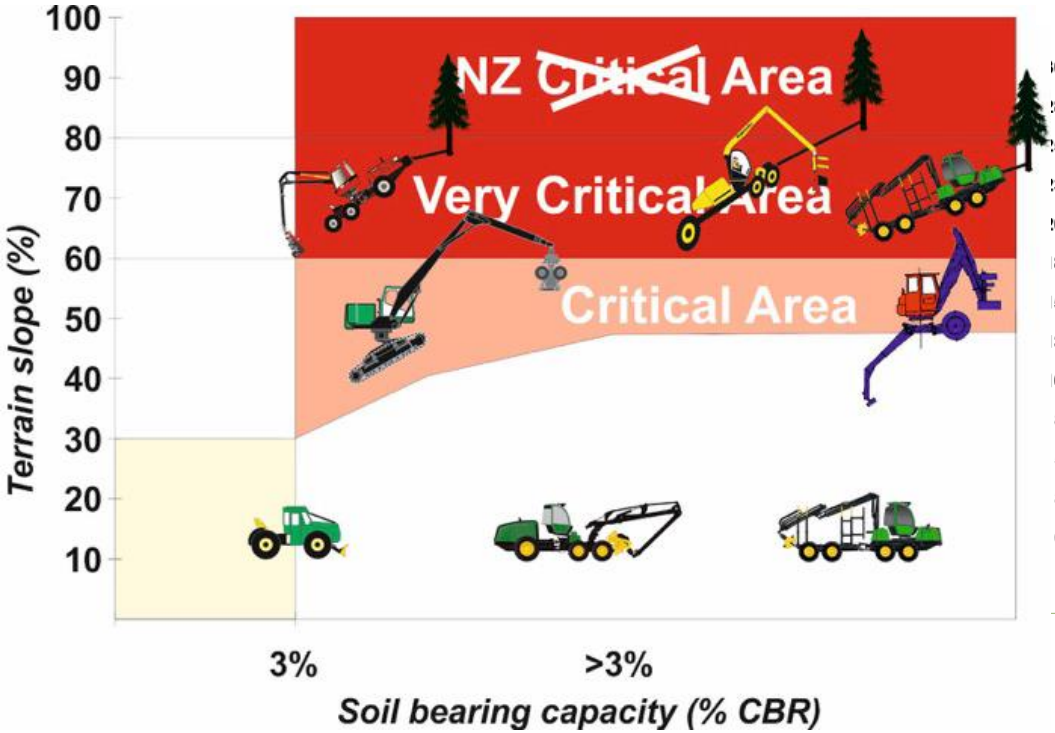


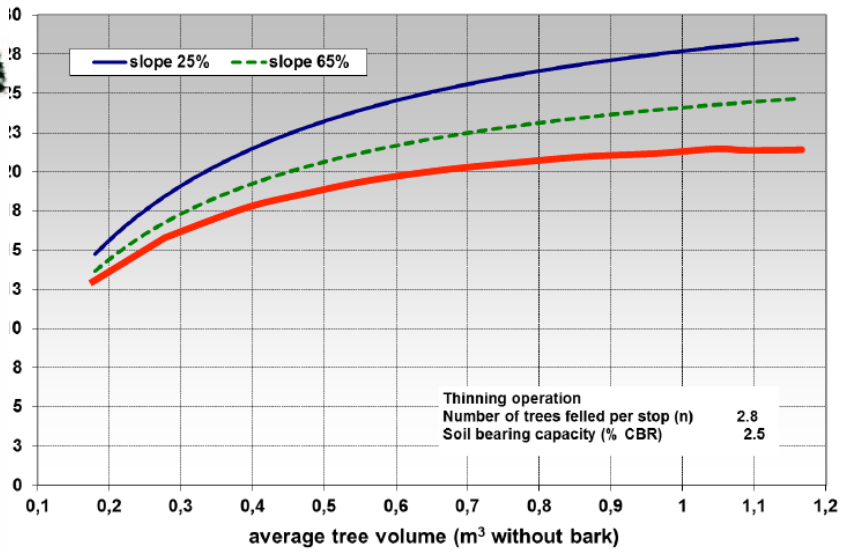
Machinery with external synchrowinch

Synchrowinch where and why?



Source: Niedersächsische Landesforste





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Experimental trials on skidders with dual winch: steel wire & synthetic rope

Synthetic rope

- Synthetic rope is made by high weight molecular fibers of polyethylene (UHWMPE)
- The weight is approx. 10 times lower than steel:
- 14mm steel wire rope: 101 kg/100m
- 14 mm synthetic cable: 10.5 kg/100m
- Low stretching: 14 mm cable at 170 kN (breaking strength): 3%
- Higher fraying for friction
- HIgher price up to 3-4 times

Synthetic rope producers

COUSIN Trestec
ROPE INNOVATION

samson

AMSTEEL® -BLUE

Dyneema®
With you when it matters

Ergonomic and economical benefits for synthetic rope

	Valoració
Millora del confort en el treball	5
Reducció del cansament muscular/esforç	5
Facilitat en pujar/baixar la corda	5/3
Facilitat d'ús de la corda	4
Reducció de ferides a mans	5
Reducció efecte "fuet"	3*
Millora d'enrotllament al tambor	4
Reducció danys arbres en peu	4
Importància del cost del material	5
Quin preu estaria disposat a pagar	3

Table 9. Productivity of the Caterpillar 3DG XL

Winch material	*N cycles*	*m^3/PMH*	*m^3/SHM*
Synthetic rope	299	8.65	7.95
Steel cable	226	7.58	6.83