Interreg Alpine Space project - **NEWFOR**

Project number 2-3-2-FR

NEW technologies for a better mountain **FOR**est timber mobilization

Priority axis 2 - Accessibility and Connectivity

Workpackage: Costs & &benefits evaluation

TEST OF THE HEPROMO SOFTWARE FOR CABLE YARDING IN THE FRENCH ALPS

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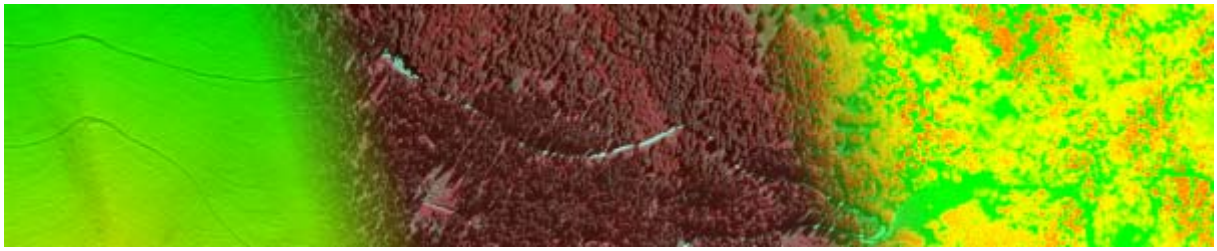
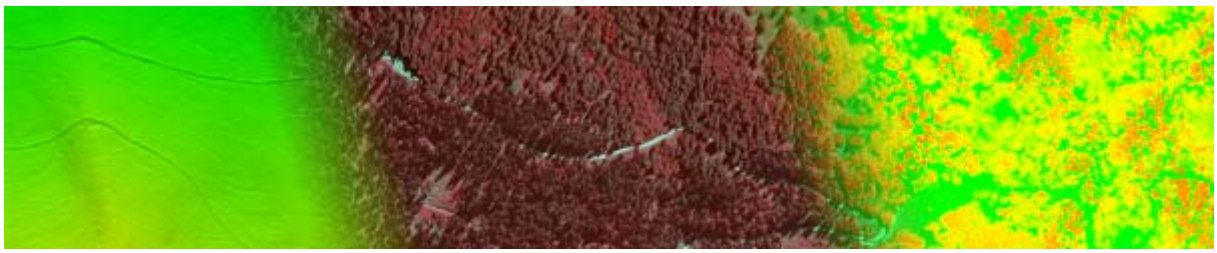
NewFor



The consortium of the project Interreg Alpine Space NEWFOR



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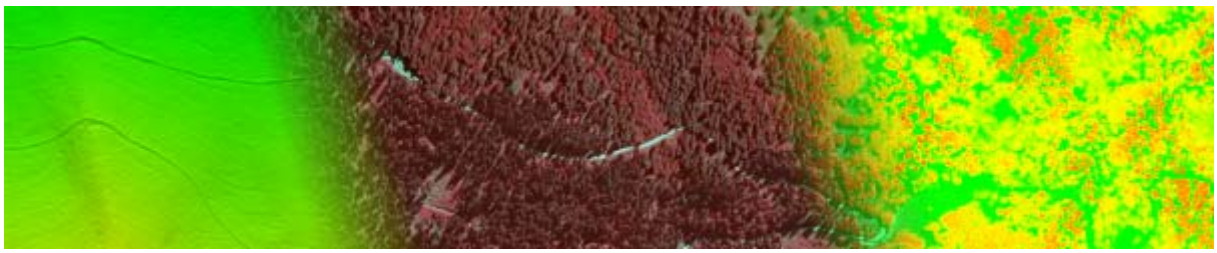
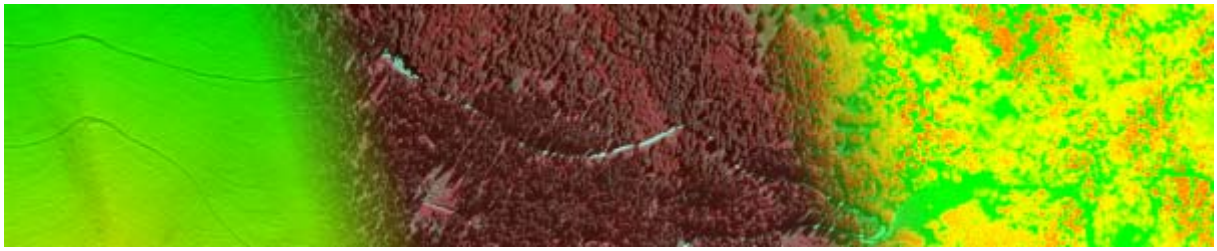


1 ABSTRACT

The purpose of this study is to compare the values provided by this software to data measured in the field, in order to identify potential differences and the main parameters for the development of specific productivity and cost models for cable crane operations in the French Alps, if needed



2 A SYNTHETIC OVERVIEWOF THE INTERREG ALPINE SPACE PROJECT NEWFOR

2.1 THE CONTEXT

The role play by mountain forests is extremely varied. Their contributions to the stability and overall development of life and economic factors in mountainous regions are highly significant. Due mainly to topographic conditions, managing mountain forests is significantly more cost intensive than in plain ones. A good knowledge of forest biomass location, characteristics, mobilization conditions and connectivity to wood industry is a prerequisite for the development of a sustainable timber supply chain in mountain territories. This knowledge is currently insufficient to provide at reasonable costs, the required guarantees on the wood supply and on its sustainability. Improving an efficient and robust evaluation of the forest growing stocks (volume and quality) and its accessibility are the efficient measures to mobilise sustainably more wood from mountain forests. As building forest roads and other infrastructures are often complex and expensive, the availability of financial resources is a key challenge. This could be achieved by providing technology and financial support. With such knowledge and tools it will be then possible to develop an active and sustainable cultivation of mountain forests and an efficient European mountain forest management policy.

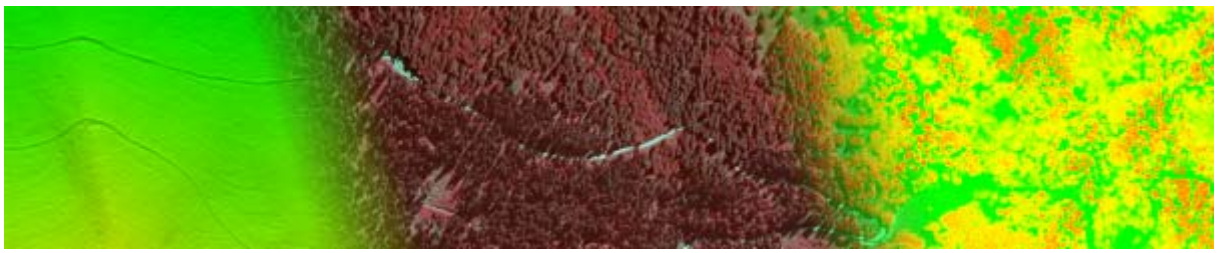
2.2 OBJECTIVES OF THE PROJECT

According to this context and based on the use of new technologies (LiDAR: light detection and ranging, Unmanned Aerial Vehicle,...) for forest and topography characterization, the project NEWFOR has been dedicated to enhance and develop tools and adapted policies for decision making in the field of a sustainable and adaptive mountain forest resources management facing the sustainability of mountain forest ecosystems services.

So, the main goal of the project NEWFOR is the improvement of accessibility to the forest for an economically effective wood harvesting and transport related to a sustainable forest management and wood industry in Changing Climate. The 14 partners involved in the project's consortium, have broken down this main goal into five thematic workpackages (wp):

- Forest resources and LiDAR

  Recent developments in LiDAR technology, combined to other available data sources (aerial photographs, aerial photo series by UAVs, …), are now allowing a precise and fine mountain forest resource quantification, qualification and mapping. Integrating this technology will provide an innovative response to the challenges of a precise and robust knowledge on the available growing stocks. The actions of this wp had for objective to test and develop tools for the use by foresters of data coming from this new technology.



- Forest accessibility

After the identification of forest resources, the second step of an efficient forest management is to evaluate the accessibility to these resources. In mountain area the slope is the main constraint to a technical and economically efficient exploitation. This wp demonstrated how to use topographic LiDAR data coupled with geographic information systems (GIS) for an optimal planning of the opening-up of forests according to the current accessibility of forest resources.

- Forest and industry connectivity

Since the forest resources and its accessibility are characterized, then the question of the actors of the wood supply chain is how to feed the wood market from the forest to the wood users? In other terms, the question is: what is the real connectivity between the wood at the road side (inside the forest) and the wood at the mill's timber yard? The objective of this wp was to answer to this question.

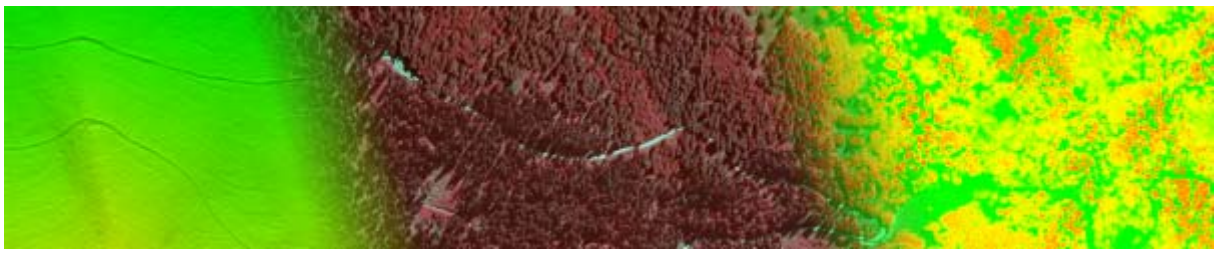
- Costs and benefits evaluation

NEWFOR aims to develop helping decision tools dedicated to defining strategies for sustainable mountain wood supply chain. To fulfil this objective the 3 first workpackages (see above) have been building up with the objective of developing tools for identifying forest resources, their accessibility and connectivity to the wood market. In order to achieve the demarche, and to choose the optimal strategy, it's necessary to evaluate, from the economical aspect, the costs and benefits of each possible strategies. This was the objective of this wp.

- Logistical planning strategy

There is a need to frequently adjust the planning of forest management to new economical evidence as well as to unforeseeable developments. Such an adaptive management needs to balance ecological, social and economic factors. The main objective of this wp was to provide forest managers and decision makers with reliable information for the evaluation of technical and economical conditions for their decision-making on timber supply chain logistical planning and land use strategies.

This project has been, co-funded by the European Regional Development Funds, and achieved under the third call of the European Territorial Cooperation Alpine Space Programme 2007-2013.



3 INTRODUCTION

In the French Alps, logging operations with cable crane are not common (Grulois 2007, Pischedda et al 2012). Less than 50,000 m3 are harvested annually by five French Alps companies and some teams from Switzerland, Austria, Italy and Slovakia that occasionally perform in the area.

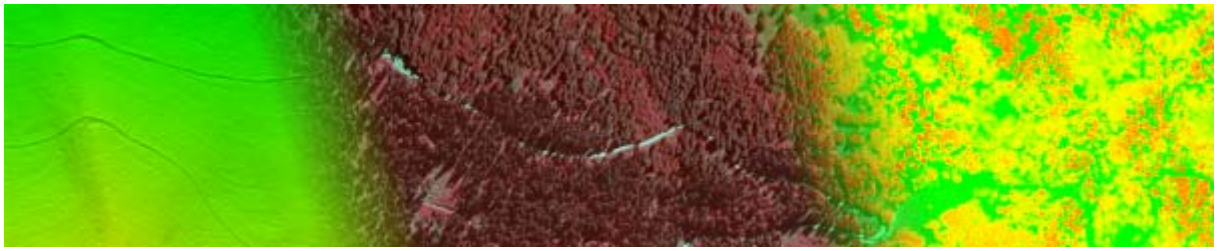
Harvesting delivery's prices (wood purchase not included) are about 40 €/m3 and are generally considered as "higher than they should or could be". Taking into account the high degree of uncertainty concerning productivity (under the influence of bad weather conditions, limited market for large timber, organizational and planning difficulties due to insufficient road network, landing places, truck's availability…..), logging contractors voluntary increase the logging service price, which is finally quite disconnected from productivity.

Swiss software, Hepromo (WSL), does exist and could be utilised to determine the harvesting cost. The principle of the software has been validated (Becuwe et al. 2010, Frutig et al. 2010, Mine 2008). But the lack of data on full trees harvesting does not validate its use in French conditions, where this kind of organisation is very common. Consequently, HEPROMO cannot be used as a relevant reference by contractors and logging companies.

The purpose of this study is to compare the values provided by this software to data measured in the field, in order to identify potential differences and the main parameters for the development of specific productivity and cost models for cable crane operations in the French Alps, if needed.

4 MATERIAL AND METHODS

Hepromo software was created in 2003, from field studies in cable crane operations. Using data from a single skyline, the software calculates the time of installation of the line, the productivity, and the cost of harvesting (€/m3). It doesn't take into account the felling costs. The result is a prevision, based on existing productivity models.



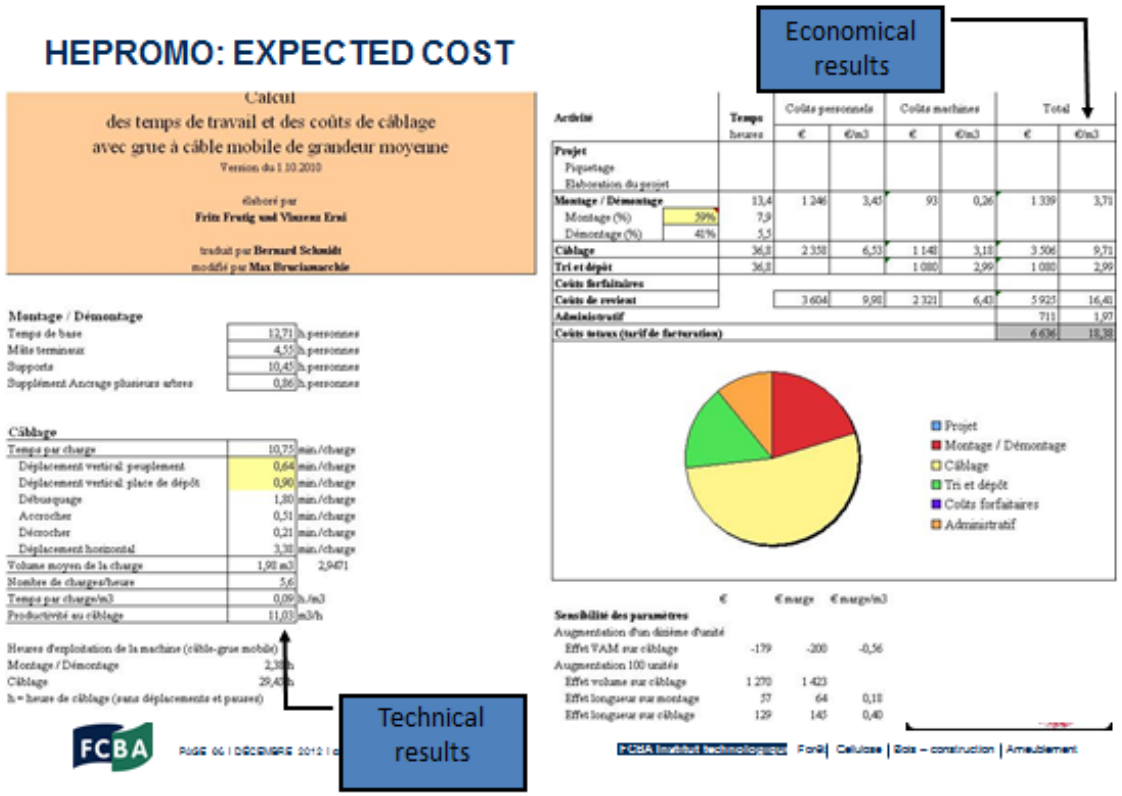


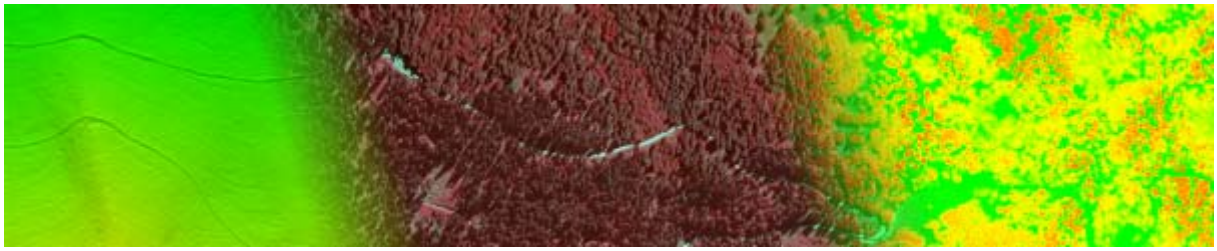
Figure 1: an example of results obtained with Hepromo (French version on Excel sheet)

In the NEWFOR study, measurements on different timber yards from French enterprises in the Alps are gathered. All logging sites are visited (description of the stand, the logging operation, field conditions), and time studies are done for at least one line, according to the European harmonized protocol AIR3-CT94-2097. Time sheets are provided to enterprises for documenting their schedules and activities (installation time linked with the number and type of supports, productivity, length of the line ....). Regular contact gives the opportunity to validate the collected data. At the end of 2013, 80 skylines on 34 logging site were followed.

The methodology (fig 2) is to determine final costs with different approach. The collected data are used as needed inputs to calculate the harvesting cost with Hepromo software. The other cost calculation approach is based on the real duration of harvesting operations and the global harvested volume of the logging operation in the field, associated to the daily cost of materials and men (methodology FAO, 1992):

$$\text{Calculated costs (€)} = \frac{\text{material's daily cost (euros/day)} * \text{duration (number of days)}}{\text{global volume (m3)}}$$

The comparison is also done with the real costs, which represent negotiated price by the logging contractor with the owner of the wood (forest owner or wood procurement company).



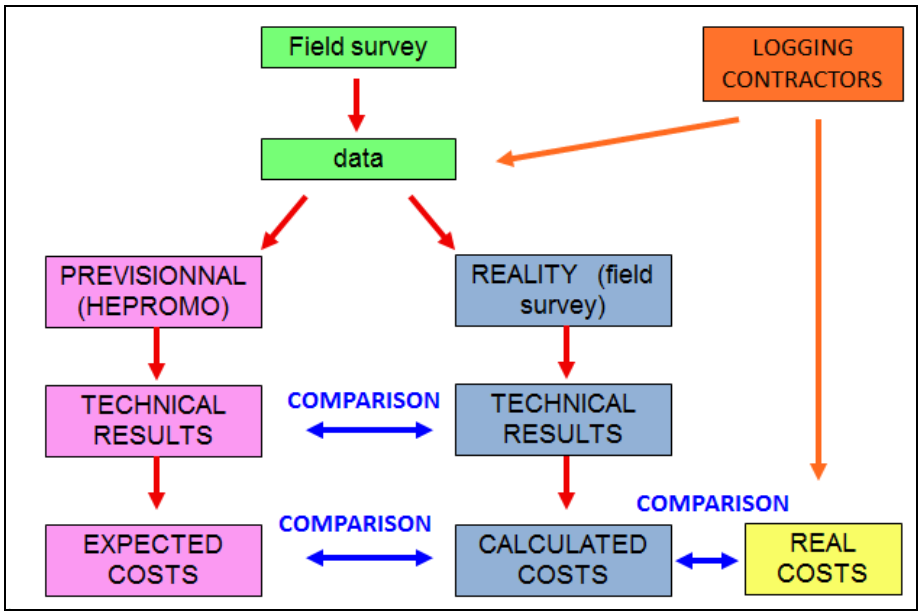
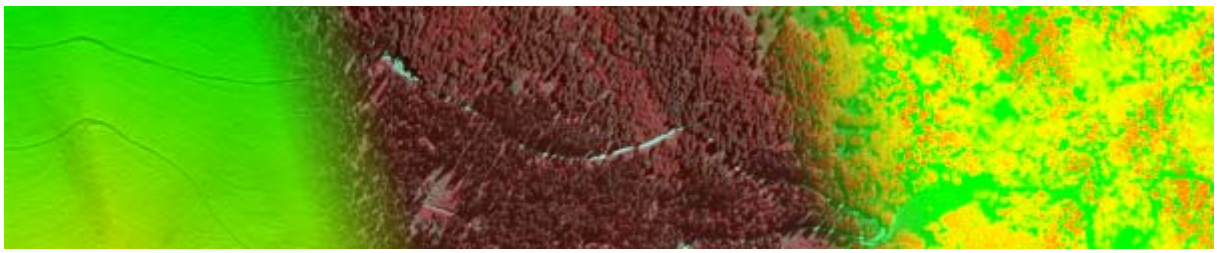


Figure 2: Methodological approach for cost comparison

Beyond the comparison of operating costs, field data are also compared to other results from Hepromo software: installation time, duration of the total cycle of the carriage, productivity… Factor analysis is used to identify the main parameters to be taken into account in the development of specific or adapted productivity models.

More over, a part of the data set will be put aside and used for the final validation of theses new productivity models.



5 RESULTS

For the cost calculation and comparison, we have taken the same hour costs for the machines and men. Costs calculated from the software Hepromo are systematically below the one calculated on material's daily cost, with an average of 33%, or 9 € / m^3 (see Figure 3). More, the variation of the two prices is not regular and can not be adapted by adding a coefficient.

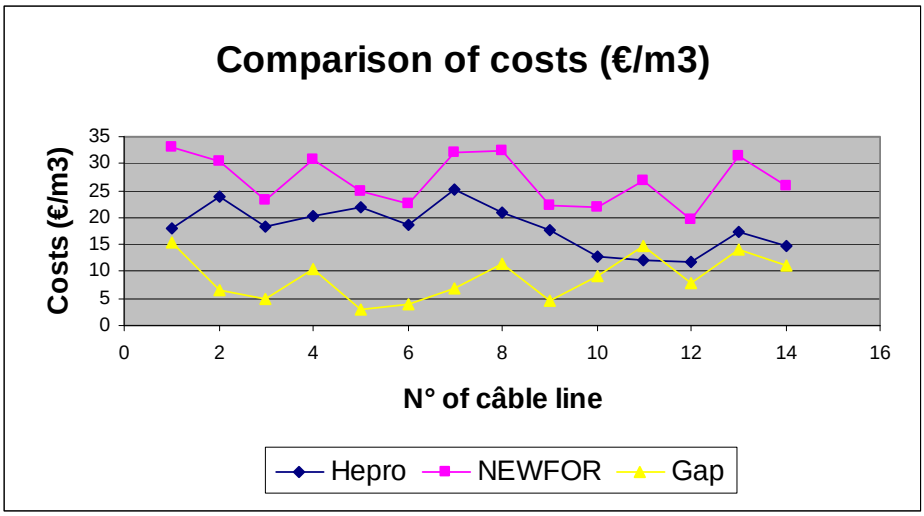


Figure 3: Comparison of costs from Hepromo software and Newfor time studies

The study of the productivity also shows irregular variation between Hepromo and time studies. The average gap is 20% and represent 2, 6 m^3/h of difference (Figure 4).

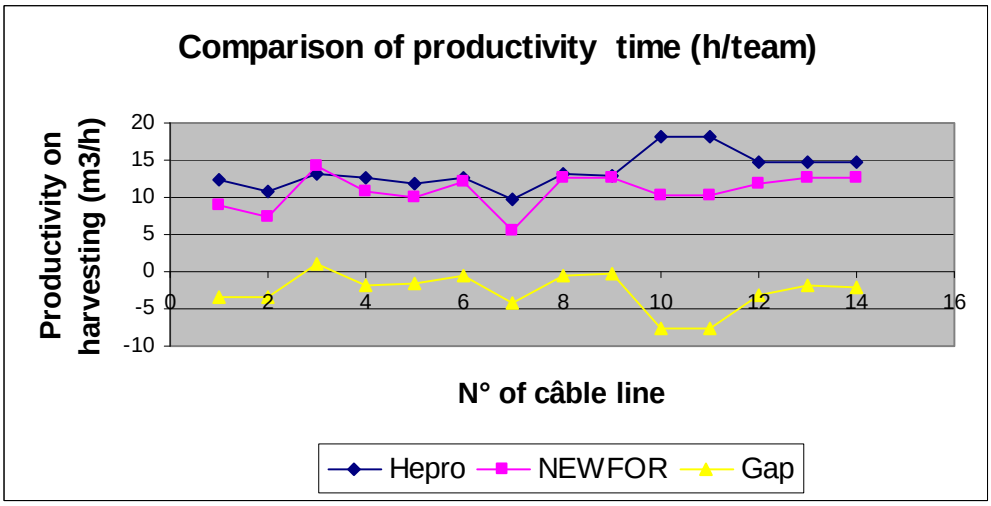
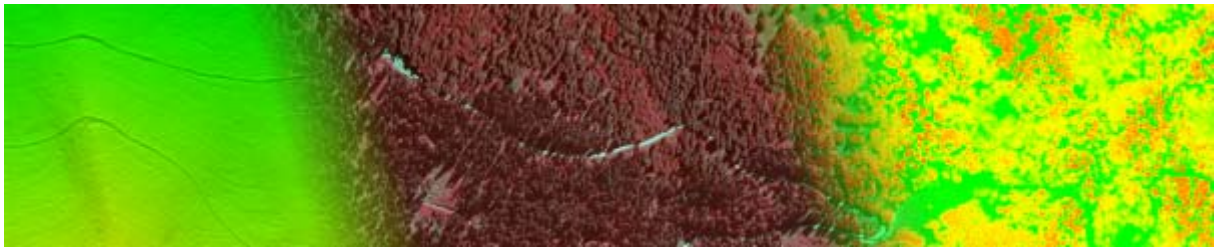


Figure 4: Comparison of productivity from Hepromo software and Newfor time studies



Hepromo is built with data coming from logs and not full tree extraction In France, most of trees are harvested with top and branches. Consequently, , the commercial volume carried on the trolley is less important. Measured productivity of French teams is often lower than Hepromo, but with regular variation (0,5m3, see figure 5) who probably represents the weight of branches.

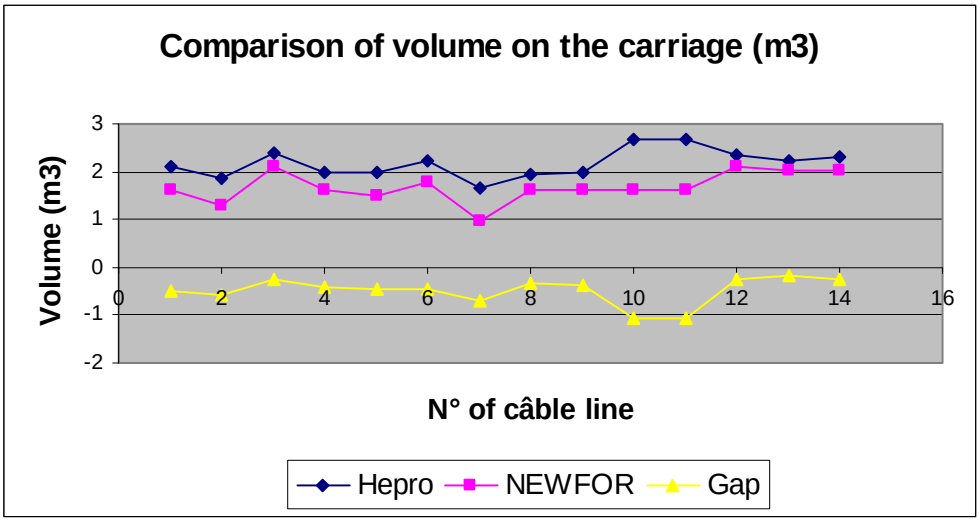
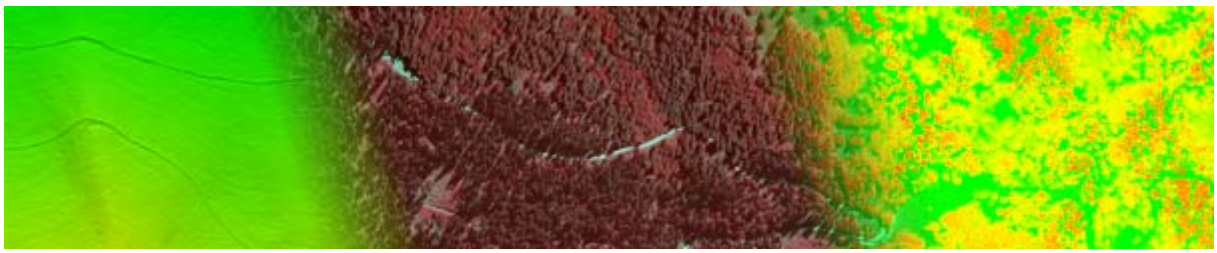


Figure 5: Comparison of volume on the carriage from Hepromo software and Newfor time studies



6 CONCLUSIONS

For the cost calculation and comparison, we have taken the same hour costs for the machines and men. Costs calculated from the software Hepromo are systematically below the one calculated on material's daily cost, with an average of 33%, or 9 € / m^3 (see Figure 3). More, the variation of the two prices is not regular and The irregular variations of the costs and productivities in the two situations (France and Swiss) can't allow using the Hepromo software in French conditions.

This study reveals the need to develop specific models for productivity and costs determination of whole tree cable yarding. In these new models we also include the installation time linked with the type and the number of supports. This should help the contractors for the elaboration of their price.

Moreover, the comprehension of the impact of external factors (roads, trucks logistics…) should lead to recommendations for improving the global system and reducing the cost of cable yarding operation in the Alps.

7 REFERCENCES

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