

Session 3 – Specific mechanization: the forestry machines

by Danilo Monarca, Chairman of the Session

The brief introduction by the Chairman of the session, Danilo Monarca, Italy, was followed by two oral presentations of Ute Seeling and Raffaele Cavalli, and subsequently by an interesting discussion.

Presentations:

1. Challenges and Drivers for Forest Technologies and Techniques in German Forestry - Ute Seeling (Kuratorium für Waldarbeit und Forsttechnik e.V., KWF – Germany)
2. A Case Study: Ground Yarding Operations in Mountainous Terrain - Raffaele Cavalli (University of Padova – Italy)

Looking back over the last decades there has been a rapid development of forest technology, leading to a quickly increasing mechanization. In her contribution Ute Seeling shows the current situation in Germany, one of the most advanced country for what concerns forestry mechanization, and the activities of the KWF, the German Centre for Forest and Technologies.

These are some of the functions of the centre:

- applying research in forest operations,
- testing, evaluating and certifying forestry equipment and technologies,
- organizing knowledge transfer,
- organizing every four years the *KWF-Tagung* (the KWF meeting, since 1964, next edition in 2020).

The three pillars of forestry mechanization sustainability are the attention to social aspects (work safety, ergonomics), environmental aspects (like nature and soil protection) and economical ones as efficiency increase and costs reduction.

Technology has brought us to the development of machines capable of reducing the requirement of manpower and operating in sloping areas, like winches with automatic guidance, climbing machines (Highlander), stepping machines, horizontal cable cranes.

In his contribution, Raffaele Cavalli emphasizes the importance of developing and maintaining forest management systems that provide a balance between land use and conservation of all the ecosystems services offered by the mountain forests.

A limit for a more efficient and full mechanization is due to the slope, but also to other terrain factors like soil strength and/or roughness.

There is interest and recent worldwide effort to improve traction of harvesting machines operating on steep slopes by means of winch-assist systems (Europe, New Zealand). The concept is relatively simple, but integrating winches and cables to machines is quite complicated. These systems can be classified in two main categories: integrated winch systems (winches built into or bolted onto the primary assisted machines) and anchor machine winch systems (dedicated anchor machines to house and power winches tethered to primary assisted machines). Winch-assist technology offers benefits for safety, productivity and efficiency of harvesting operations, as well as for improving felling machine mobility and reducing soil disturbance.

With the development of technology, it is now possible to introduce the concept of teleoperation using unmanned ground vehicles (“no worker on the slope, no hand on the chainsaw”), where the machine is controlled by an operator at a remote location with cameras, sensors and additional positioning software.

In the discussion the participants dealt with different aspects of forestry mechanization:

- the use of residues (branches, prunings) as bioenergy;
- the rapid development for ecology and safety, as well as for harvesting new areas and increased productivity;

- the problems caused by the decrease of workers in many developed countries (japan, europe);
- the need for a proper strategy for future mechanization of africa;
- the emphasis on the reduction of soil compaction caused by forestry machines;
- the strategic importance of training and teaching the operators (safety challenges with large machinery and lone workers are still problematic);
- biodegradability of oils used, to avoid chemical soil contamination.
- standards for radiofrequency communication and need of a strong and reliable signal net.

Main motivations driving further technologies developments are:

- increased productivity and reduction of costs (working process, logistics, remote operation, tele operation, robotics and fully autonomous machines);
- reduction of accidents/increase of safety;
- soil and nature protection.

To sum up, the discussion was interesting and full of different insights.

The two lecturers have certainly given their notable contribution to this topical issue.