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Abstract

The Landes forest, south-western France, produces 1/5 of french wood, but was hit by two major storms in 1999 and 2009 which halved the stocking in this forest. Wood industry absorbs already all the wood production, but fuelwood power plants have settled down in this area in recent years. Therefore there is an increased interest in yielding stumps and branches in this forest, and in other forested areas in the world. However, increasing biomass removal, and hence nutrients, has raised concerns about the sustainability of site fertility and forest productivity.

We estimated biomass stocks of below-ground biomass from a sample of 72 harvested trees. Additionally, fine roots were collected at the stand level. We measured the nutrient (N, P, K, Ca, Mg) contents of the different root compartments (stumps, coarse and thin roots). Different scenarios, including harvests of above and below-ground compartments were used to assess the corresponding biomass and nutrient exports. The quantification of the effect of different scenarios of stump harvest was achieved by 3D digitized data of root architecture of a sample of root systems in which virtual harvesting could be done.

This permitted to show that nutrient concentration only depends upon root diameter and not upon root type (e.g. sinker, taproot, shallow horizontal root). Nutrient contents exhibit small variation for cross sectional diameters larger than 1 cm, and increase dramatically for smaller roots. Nutrient losses were much higher in canopy harvest scenarios than in root harvest scenarios. This was mainly due to higher nutrient contents of needles whereas in roots, higher nutrients contents are only found in fine roots which were only marginally harvested by stump removal.

Stump and large root harvest, collecting roots only in the close vicinity of the stumps, could be sustainable, but not foliage harvest. However, stump harvest has other incidences on soil and ecosystem.